



CIEEM

Issue 114 | December 2021

inpractice


Bulletin of the Chartered Institute of Ecology and Environmental Management

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Editorial



Welcome

As I start my term as President I am full of hope. Perhaps like many who work in the environment sector, hope is something I have clung to all my working life. Hope has motivated me and has tangible health and well-being benefits, which have probably played a part in combating my despair and anxiety about the state of the natural world, which is something else that has been with me all my working life.

Hope is not just a personal source of motivation, it's also a social gift that brings people together and unites them in a common cause. That is perhaps my greatest source of hope – the power of dedicated, passionate people to make the changes needed to restore and improve the environment for people and wildlife. This is clear to me every day, because hope springs from being surrounded by people who are similarly motivated, working tirelessly, to provide evidence, influence decision-making, educate and engage others, support those working in the sector or guide others to do less harm and more good.

That is why I value so highly the work of CIEEM members and staff, and the work of many others in the sector, and why I think I benefit personally from my involvement.

I'm writing this before the COP26 Climate Change Conference has happened. My hope is that COP26

will prove to be the breakthrough we need to get all nations on a trajectory to achieving the Paris Climate Accords. But perhaps my greatest hopes for COP26 are that the global response to the climate emergency will be ecologically coherent and put today's children and future generations, in every nation, at the heart of decision-making. I am so humbled and inspired by the leadership and initiative of young people around the globe. They give me hope, and we must make sure that their futures weigh heavily on the minds of those making decisions for them at this time.

I think it is clear that restoring nature and creating more natural habitats, on their own, will not be enough to tackle the climate emergency. Significant decarbonisation of the whole economy is also needed as quickly as possible. As ecologists and environmental managers we have knowledge and skills that are desperately important if we are to optimise what we do on climate to deliver coordinated action and wider benefits. It is essential that we work collaboratively with many professions and other communities to ensure climate policy and actions also address the nature emergency and deliver wider benefits, like health and well-being, flood attenuation and resilience, and air and water quality improvements. Again, that is where CIEEM plays a vital role representing the professions and advocating our role in delivery of integrated outcomes.

The COP15 Convention on Biological Diversity has no less a mountain to climb. After decades of shared failure

on biodiversity targets, the new draft Global Biodiversity Framework “sets out an ambitious plan to implement broad-based action to bring about a transformation in society's relationship with biodiversity and to ensure that, by 2050, the shared vision of living in harmony with nature is fulfilled.”

I think that emphasis on society's relationship with nature is absolutely right. My hope is that COP26 will not be seen as the main event and the critical links between the climate and nature emergencies will be foremost in delegates' minds at both conferences.

I do not rely on hope alone. Apart from anything else I know we also need diverse, well-trained, talented and motivated ecologists and environmental managers. I hope like me you see that supporting, growing and promoting ecology and environmental management will help to provide society with the skills and knowledge we need to repair the damage we have done to nature and start living in harmony with the natural world.

Finally, I want to thank Max Wade for the great contribution he has made as President of CIEEM over the last 3 years. During that time CIEEM has grown and weathered the most significant economic and social crisis most of us can remember. He has led with calm competency, always putting people first and giving wise council. Max – you will be missed in this role, but I know the staff, Governing Board and membership look forward to working with you in other capacities.

Richard Handley **CEcol MCIEEM**

CIEEM President



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2022 CPD DATES FOR YOUR CALENDAR

18 & 20 JANUARY

Designing for Biodiversity Net Gain

(Online Training)
2 half days

25 & 27 JANUARY

CIEEM Welsh Conference

(Online)
2 half days

MARCH

CIEEM Spring Conference (TBD)

30 & 31 MARCH

**Phase 1
Habitat Survey**
(Classroom & Field-Based Training), 2 full days
Dunkheld, Scotland



CIEEM

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Cover photo: Urban fallow deer on UK housing estate at night

In Practice

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Past Presidents celebrate CIEEM's 30th anniversary

In September this year we brought together the current CIEEM President along with three Past Presidents to celebrate CIEEM's 30th anniversary. The illustrious panel – all CIEEM Fellows – briefly discussed where CIEEM has come from, and then looked to the future of the Institute and the sector.

A blog of the event is available on the CIEEM website (<https://cieem.net/past-presidents-celebrate-cieems-30th-anniversary>), which also links to the full event recording.

Recent webinars

We continue to run a full and varied series of webinars for members and the sector. Readers may be interested in the below recent webinars that are available on the CIEEM Resource Hub.

- Back from the Brink: Practical Restoration in the UK Overseas Territories
- Identifying Long Term Evidence Needs for Biodiversity Net Gain
- Herpetology in the UK Overseas Territories: Spotlight on Iguana Conservation
- 2020 – Conservation Approaches to Benefit Biodiversity: Big Ideas for Big Challenges
- 2021 – Nature-based Solutions: opportunities in a time of biodiversity crisis and climate emergency

Readers may also be interested in CIEEM's monthly topical webinar series – Sector Streams – hosted by CIEEM's Head of Policy, Jason Reeves CEnv MCIEEM. Each episode brings together a panel of experts to discuss the issues at hand, and also invites questions from the audience. We are taking a break over the festive break but will be back in 2022.

- CIEEM Sector Streams Webinar Ep6. Invasive Species and Biosecurity (July 2021)
- CIEEM Sector Streams Webinar Ep7. Environmental Net Gain (August 2021)
- CIEEM Sector Streams Webinar Ep8. The Next Generation (September 2021)

- CIEEM Sector Streams Webinar Ep9. Economics and the Environment (October 2021)

Past webinars are available in the CIEEM Resource Hub (<https://cieem.net/i-am/resources-hub/>). Also look out for future webinars in events and training listing on the website (<https://events.cieem.net/Events/Event-Listing.aspx>).

Recent blog posts

Recent blog posts on the CIEEM website (<https://cieem.net/news/>) include:

- Awards 2021 Winners' Spotlights (for all Awards categories)
- A Super Year for Nature in Scotland: Joint Event by BES and CIEEM – by Annie Robinson
- Dialogue Matters Deputy Director and Project Manager standing in the foyer of BEIS 2019
- COVID-19: Yesterday's Problem or Today's Challenge? – by Max Wade
- Species Range Shifts: Impacts and Barriers to Movement – by Jean Hamilton
- Biodiversity Net Gain in the UK – Birds and Bees and British Standards – by Claire Wansbury
- New paper on the evidence-base behind species mitigation measures – by Bronwen Hunter

- Past Presidents celebrate CIEEM's 30th anniversary

If you would like to contribute your own blog, please contact sophielowe@cieem.net.

In Practice digital editions

If you would like to reduce your and CIEEM's carbon footprint and receive only digital editions in the future, please contact enquiries@cieem.net.

Staff changes

Since the last edition of *In Practice* we have had three new members of staff join the secretariat team.

In September we welcomed Johanna Cleaves (as Professional Development Administrator) and Suzanne Gilding (as Membership Administrator). And in October we were joined by Helen Winstanley (as Administrative Officer).

Merry Christmas & Happy New Year

We hope you have a peaceful and restorative festive break. We will see you again in 2022, ready to tackle the issues facing the sector and celebrate our successes and achievements.

CIEEM Conferences 2022

Date	Title	Location
25 & 27 January	2022 Wales Conference – Invertebrates	Online
March	2022 Spring Conference – Biodiversity Net Gain in Practice	Birmingham

Find out more: <https://cieem.net/events>

In Practice Themes and Deadlines

Edition	Theme	Article submission deadline
March 2022	Working on Site	n/a
June 2022	Nature-based Solutions	18 February 2022
September 2022	Bryophytes and Lichens	20 May 2022
December 2022	Non-themed (submissions welcome on any topic)	19 August 2022

If you would like to contribute to one of these issues, please contact the Editor at nikprowse@cieem.net. Contributions are welcomed from both members and non-members. Further information and guidance for authors can also be found at: <https://cieem.net/in-practice/>

Nature agencies call for greater action and investment for biodiversity

Five UK statutory nature agencies have issued a report calling for greater action and investment in natural solutions. The Nature Positive 2030 report by Natural England, Natural Resources Wales, NatureScot, Northern Ireland Environment Agency and the Joint Nature Conservation Committee sets out the priority actions and achievable steps for reversing biodiversity decline by 2030, and concludes that we are currently not on track to reach this goal, but that this aim is achievable.

<https://cieem.net/nature-agencies-call-for-investment-in-nature/>

Environment Bill amendment to "halt" biodiversity loss by 2030

The UK Government has tabled several amendments to the Environment Bill including a strengthening of the duty to set a target for halting species declines by 2030. Amendments also bring in further safeguards for the Office for Environmental Protection and a duty to review and, if appropriate, increase the minimum duration for which Biodiversity Net Gain must be secured.

www.gov.uk/government/news/landmark-environment-bill-strengthened-to-halt-biodiversity-loss-by-2030

IPCC publish sixth major climate change assessment

The Intergovernmental Panel on Climate Change (IPCC) has published the first instalment of its sixth assessment report, warning "widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere" are already being felt across the globe.

<https://cieem.net/ipcc-publish-sixth-major-climate-change-assessment/>

New Defra Minister and Housing Secretary appointed in cabinet reshuffle

Prime Minister Boris Johnson has reshuffled his Cabinet, appointing Michael Gove as Housing Secretary and promoting Victoria Prentis to Junior Minister at Defra. Reports state Gove has paused proposed planning reforms which would simplify planning into zones, following concerns from MPs.

<https://cieem.net/new-defra-minister-and-housing-secretary-appointed-in-cabinet-reshuffle/>

The state of no net loss/net gain and biodiversity offsetting policy in English local planning authorities

Dr Morgan Robertson has published a detailed report on the state of biodiversity no net loss, net gain and offsetting in local planning authorities in England. The report highlights issues with lack of resources in delivering Biodiversity Net Gain.

<https://cieem.net/resource/lpa-survey-morgan-robertson/>

Scottish Government and Scottish Greens agree shared programme

Scottish Government and the Scottish Green Party have agreed to work together over the next 5 years and have made a host of commitments, including introducing a Natural Environment Bill in 2023-24 to set legally binding targets. Two Green Party members have been appointed as Ministers with Lorna Slater as Minister for green skills, circular economy and biodiversity and Patrick Harvie as Minister for zero carbon buildings, active travel and tenants' rights.

<https://cieem.net/scottish-government-and-scottish-greens-agree-shared-programme/>

New initiative to save Wales' threatened species | Menter newydd i achub rhywogaethau sydd dan fygythiad yng Nghymru

A new initiative, *Natur am Byth*, to save rare species has been launched in Wales. The project will consult with local communities, conduct species surveys and plan detailed recovery plans for species and habitats across many of Wales' landscapes.

<https://naturalresourceswales.gov.uk/about-us/news-and-events/news/new-initiative-to-save-wales-threatened-species-with-lots-of-opportunities-for-people-to-get-involved/>

Vision for Future Farming Policy in Northern Ireland published

Agriculture Minister Edwin Poots MLA has set out the future direction of farming support in Northern Ireland, setting environmental sustainability as one of the four key outcomes of the new framework.

www.daera-ni.gov.uk/news/poots-publishes-vision-future-farming-policy-ni

New guidance on bat surveys, assessment and mitigation for onshore wind turbine developments in Northern Ireland

The Northern Ireland Environment Agency Natural Environment Division has published new Guidance on Bat Surveys, Assessment and Mitigation for Onshore Wind Turbine Developments in Northern Ireland. The guidance published applies to both proposed single wind turbine developments and wind farms.

<https://cieem.net/new-guidance-on-bat-surveys-assessment-and-mitigation-for-onshore-wind-turbine-developments-in-northern-ireland/>

Urban Wilding: Are There Lessons We Should Learn?

Figure 1. Spontaneous, species-rich grassland, including several exotic species, on a disused railway platform in South Norwood, London. It is buzzing with pollinators and admired by commuters. Photo: Richard Gowing.



Richard Gowing
CEnv MCIEEM

Keywords: open mosaic habitat,
spontaneous urban vegetation

This Viewpoint article takes a brief look at some issues and opportunities relating to small-scale, urban wilding. It argues that current consultancy approaches are suppressing a wilder, richer biodiversity from arising in urban areas by under-appreciating the unique properties of urban spontaneous vegetation, which supports important biodiversity.

Introduction

Urban wilding sounds like an oxymoron. Urban areas are dominated by people but wilding happens in vast, open spaces where large predators roam, does it not? Surely the two concepts are a world apart?

I think this dichotomy is misconstrued. Clearly, taking a wrecking ball to our cherished streetscapes and introducing an open, grazing savannah is not something we would ever want to do. However, there are lessons to be

learned by urban ecologists from being open-minded to the philosophies and practices of the wilding movement. Casey *et al.* (2020) recently made the case for small-scale, patch-based wilding to enrich biodiversity in intensively farmed landscapes. Applying similar principles in the urban environment offers much potential for stimulating urban wildlife.

Empty buzzword or useful tool for urban nature conservation? What follows is a rapid tour of several issues and opportunities for small-scale urban wilding.

Wilding defined

The term wilding (or re-wilding) is slippery. It means different things to different people. Is the objective to restore an ecosystem from the past and, if so, what past? Are people supposed to be part of wild nature or apart from it? It is beyond scope here to tackle these complicated

issues. Here, when I refer to wilding, I mean the spontaneous plant and animal communities that occur when urban land is freed from regular, active management (e.g. see www.spontaneousurbanplants.org/about/).

Wilding of the mind

My starting point for applying the concept of wilding to towns and cities is that one does not have to be in a wilderness to find the concept relevant. This is because wilding is an approach to thinking about and managing the natural environment as much as any specific place. When you imagine a biodiverse environment in the UK, what do you instinctively think of? Take a moment to do this before you read on.

Did you conjure up a mental image of a flower-rich meadow, bounded by hedges; or perhaps a mountain stream? You are likely to have visualised somewhere bucolic, in the open countryside or a remote moorland

rather than somewhere urban. There is an important point behind this simplistic mind experiment. The psychology of what we consider worthy of conservation, and the resulting landscapes we create, are likely to be conditioned by our education and upbringing (among many other factors). If our point of reference for 'good' biodiversity is away from the city, we will only ever see urban areas as diminished versions of this halcyon vision.

This intrinsic bias is more than just trivial. I frequently read ecological reports written for highly urban sites recommending 'enhancement' measures, as if the site was situated in the middle of a Constable landscape painting from 19th century Suffolk. Ecologists seem automatically programmed to want to recreate islands of 'traditional' countryside in between buildings.

One wouldn't want to overplay this observation. For example, where I live in south London there are indeed some

fine examples of ancient woodland and chalk grassland between busy roads and areas of housing. However, by adopting a 'wilder' perspective in our heads we would allow for alternative, perhaps more innovative approaches to urban habitat design. More importantly, we might learn to target the 'wild' biodiversity that has actually adapted and evolved to live in towns and cities (e.g. Schilthuizen 2018), rather than the biodiversity that lives in our minds.

An unnatural ecology?

Urban ecosystems have a number of distinguishing properties. They are highly disturbed. Urban soils are often thin and have a high mineral content arising from years of human building activity. Urban climates are, on average, warmer than surrounding rural areas. Towns and cities are also focal points for the introduction of non-native plants and animals, whether intentionally or as stowaways, transported by the movement of goods and people.



Figure 2. Meadows in the metropolis, such as here in what would otherwise be manicured amenity space between residential blocks in Kidbrooke, London. Photo: Richard Gowing.



Figure 3. An example of what can be done with novel substrates and not being too picky about the 'right' types of plants to sow. Photo: John Little.

These peculiarities may lead some to conclude that urban areas are unnatural; hence, how could we value them as wild nature? Yet consider what happens when a brownfield site in an urban area is cleared and species are permitted to colonise. This happens regularly, for example, when a building is demolished and development doesn't follow straight away; or maybe where maintenance lapses in the corner of a park. The ecological community that assembles spontaneously may be part grassy, part tall herb and/or part scrub. Both native and non-native species are likely to be present. The composition of this habitat is likely to be a direct response to the prevailing abiotic conditions. It is likely to be highly distinctive and often very diverse. One might say self-willed, or even wild.

I feel that ecologists continually close the door on novel and distinctive urban plant and animal communities of high-potential nature conservation interest by having fixed pre-conceptions about the 'correct' type of biodiversity in towns and cities. This is likely caused by failing to appreciate the unique (and completely natural) ecosystem processes which give rise to urban biodiversity.

If we build it they will come

We have known for many years that urban habitats on brownfield land may be rich in biodiversity. For some invertebrate groups such land may support a higher species diversity, including a higher number of rare and threatened species, than equivalent areas of intensively managed countryside (e.g. Gibson 1998). These ideas underpin the inclusion of Open Mosaic on Previously Development Land (OMPDL) as a Habitat of Principal Importance for conservation in the UK (often referred to as priority habitats) (Biodiversity Reporting and Information Group 2011).

There is a body of evidence that identifies the types of previously developed land which support rich biodiversity. Such land contains bare, low-nutrient and varied substrates, a varied microtopography, early-successional, flower-rich plant communities and sometimes areas of wetland, scrub and woodland (e.g. Lush *et al.* 2013).

Whereas ecologists know a lot about the things that encourage brownfield biodiversity, in my experience we design

new habitats around development sites focusing solely on the botanical species we would like to sow or plant. The phrase "plants of known benefit to wildlife" has become widespread rhetoric, used unthinkingly in ecology reports. Does anyone really know what these plants are, and can such a universal list exist for all contexts? A poignant critique of wildlife planting lists is given by Thompson (2007).

If one adopts a wilder approach to urban landscape design, perhaps we would get more value by creating the correct conditions to support high biodiversity and letting wild species find their own way into our urban landscapes. Rather than fixating on planting lists, we should worry more about training ecologists to beneficially use different types of aggregate and mineral soil to create the complex substrates required by rare/threatened brownfield invertebrates and diverse early-successional plant assemblages. There are some fine examples of good practice in this area (e.g. BSG Ecology 2019, Little 2020), but this thinking should become mainstream.

Some of our wild habitats are missing

We often place greatest value on what we can see. In the context of ecology consultancy, we place value on what we are able to map, measure and identify. However, many habitat classifications are deficient when it comes to characterising the diversity of habitats present in towns and cities.

For example, a range of potentially unique early successional tall-herb communities are packaged up under 'ephemeral short perennial' in the Phase 1 habitat survey (Joint Nature Conservation Committee 2010). The new UK Habitat typology (see the UK Habitat Classification System, habitat definitions version 1.1; <http://ukhab.org>) places 'ruderal/ephemeral' vegetation under secondary code 17, perhaps giving it secondary status too. The typology used by Biodiversity Metric 3.0 (Natural England 2021) only allows for high-distinctiveness ruderal/ephemeral urban vegetation if an area of habitat qualifies as OMPDL, but, to qualify, the vegetation must be over 0.25 ha. The Biodiversity Net Gain condition assessment for urban habitats (criterion 2) excludes non-native plant species as contributing to good condition; this omission seems naive given the exotic composition of many urban ecosystems in their 'wild' state. Despite recognising the importance of self-willed, brownfield land in urban areas, it appears that we lack the vocabulary to identify it when it occurs at the small scale. I suggest this restricts our ability to appropriately value and protect it also.

There has been some interesting work in the past on characterising the importance of novel urban plant communities to invertebrates (Bodsworth *et al.* 2005). I would like to see this evidence base extended to the small scale (what types of biodiversity do small patches support?) and the

findings communicated more fully to ecology practitioners. In my view, Biodiversity Metric 3.0 is a missed opportunity to account for small patches of urban habitat that don't fit the mould but which are nonetheless highly biodiverse.

Urban microhabitats: is there room for urban wilding?

I have not covered the social side of the argument for urban wilding due to the need for brevity in this article. The benefits of increased contact with wilder nature are potentially manifold (e.g. Bowler *et al.* 2010). Clearly wild habitats and landscapes are only appropriate in specific contexts. In fact, I suggest that we must be judicious and sparing in where we allow wild, spontaneous urban vegetation to develop. If it is seen to compound problems of deprivation and urban decay it may lead to socio-economic disbenefits (e.g. it may be perceived as unsafe or to encourage antisocial behaviours; e.g. Burgess *et al.* 1988, Riley *et al.* 2018). Such a result could be a major own goal for urban conservation.

This said, we are currently suppressing a wilder, richer biodiversity from arising in urban areas by lacking an openness of mind, failing to be creative in our designs and under-appreciating the unique properties of urban ecosystems which give rise to unique and important biodiversity.

Every day when I walk around London, I spot the many forgotten corners in our urban fabric, the spaces between where our busy lives occur. These are urban microhabitats. The figures that accompany this article profile a few contexts where I feel there is scope for us to let our imaginations run a little wilder. Go on, don't be afraid: give it a try. Something unexpected and wonderful might happen.

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Increasing Numbers of Local Nature Reserves in Urban Areas in England over the past 30 Years



John Box
CEcol CEnv FCIEEM

Green and blue spaces rich in wildlife are good for everyone. Standards created in 1993 for the provision of accessible natural green space in urban areas include Local Nature Reserves (LNRs) designated by local authorities throughout the UK. The provision of LNRs in 27 urban local authority areas in England was reviewed in 2006 and 2021 and compared to the 1993 target of 1 ha of LNR for every thousand population. Standards and targets that link people and wildlife can be powerful levers for change. LNRs should become one of the cornerstones of the Local Nature Recovery Strategies.

Keywords: blue-green infrastructure, health, Local Nature Recovery Strategies, Local Nature Reserves, well-being

Natural spaces in urban places

Green space, blue spaces (watercourses and waterbodies) and parks are the places where those who live and work in urban areas have the contact with nature that is important for their mental and physical health and well-being and their quality of life (Twohig-Bennett and Jones 2018, Lovell *et al.* 2020). Public access to wildlife and natural places in urban areas continues to be very important for policy and strategic planning ever since the pioneering efforts in the early 1980s in the West Midlands, Greater London and other major urban areas to create wildlife habitats on urban sites with previous industrial uses (Goode 1989).

'Natural spaces in urban places' was the catchy title of the article in 1993 that promoted the concept of a hierarchy of area and distance categories for accessible natural green space in urban areas (Box and Harrison 1983). The evidence base was established (Harrison *et al.* 1995) and the set of standards has been subsequently promoted by Natural England (English Nature 1996, Natural England 2010):

- an accessible natural green space of at least 2 ha in size, no more than 300 m (5 minutes' walk) from home

- at least one accessible 20 ha site within 2 km of home
- one accessible 100 ha site within 5 km of home
- one accessible 500 ha site within 10 km of home
- statutory Local Nature Reserves at a minimum level of 1 ha for every thousand population.

The provision of Local Nature Reserves (LNRs) in relation to the size of the resident population is a simple and effective measure to promote the formal designation of sites that are managed to high standards for their natural features, habitats and species, for environmental education and for the enjoyment of nature by the public and local residents (Figures 1 and 2). Local Nature Reserves are sites of high nature conservation value where wildlife and natural features can be experienced and enjoyed whether in inner city areas, the urban fringe or rural areas. People experience nature where they live and work. The quality of green and blue spaces is a key factor in terms of their ecological and educational benefits and their contribution to the health and well-being of local communities and of the general public (Zhang *et al.* 2017, Lovell *et al.* 2020).

“ LNRs are sites of high nature conservation value where wildlife and natural features can be experienced and enjoyed in inner city areas, the urban fringe and rural areas. ”



Figure 1. The pond at The Beeches LNR (Telford) through the year (clockwise from top left): pond restoration, frogs breeding, newt survey, snowmen. Photos (clockwise from top left): John Box, Beeches Volunteers, Jackie Bletcher, Peter Hodgkison.

LNRs are a statutory designation made by principal councils in the UK on land they own or control. Parish and town councils can declare LNRs but the relevant powers must be delegated to them by a principal council. The primary land use of a LNR must be nature conservation and the demonstration of a positive land use has important benefits by excluding the potential for other land uses, such as built development. There are 1666 LNRs in England (March 2021 data). LNRs are best seen as nodes in multi-functional green networks, placing them in a landscape context, valuing them as part of the local environmental resources and drawing attention to their excellence as sites of nature conservation value (Barker 1997).



Figure 2. Annual community picnic at Lodge Field LNR (Telford). Photo: Graham Peet.

Provision of LNRs in 1993, 2006 and 2021

The numbers and areas of LNRs related to the size of the resident population was originally determined in April 1993 for a number of urban local authority areas in England that were selected to represent the range from large cities to smaller towns (Box and Harrison 1993). The LNR provision in these same urban areas was reviewed in December 2006 (Box 2007) and again in June 2021 (Table 1). The 2021 review included 27 urban local authority areas and the original published data for 1993 and 2006 have been reassessed and updated. The number and area of LNRs was taken from Natural England data

that were available in 1993, 2006 and 2021, supplemented by more accurate local authority data for a few LNRs. The resident population of each local authority area was taken from the national census data for 1991, 2001 and 2011.

The standard of 1 ha of LNR for every thousand population was achieved in two urban local authority areas (Canterbury, Wakefield) in the 1993 assessment. This had increased to six by the 2006 review (Canterbury, Gloucester, Norwich, Stoke-on-Trent, Telford and Wrekin, Wakefield) and to seven by the 2021 review with the addition of Plymouth. Such impressive achievements by these local authorities

reflect the importance that the public gives to wildlife and natural places. The presence or absence of LNR champions both in the urban local authorities and among local voluntary groups is undoubtedly a significant factor (Nilon *et al.* 2017, p. 340).

The range of LNR provision in the 27 local authority areas in 2021 (Table 1) ranges from 1 ha for every 122,410 population (Camden) to 1 ha for every 360 population (Canterbury). The provision of LNRs will be different in highly urbanised areas (for example Birmingham, Camden, Haringey, Islington, Liverpool, Sandwell, Southwark) in comparison with those major urban areas that have rural

Table 1. Local Nature Reserves in 27 urban local authority areas in England in 1993, 2006 and 2021.

Urban local authority area	April 1993 ^a		December 2006 ^b		June 2021 ^c		Comments on provision ^d
	Total LNR area (ha) (no. LNRs) Resident pop.	Resident pop./ha LNR	Total LNR area (ha) (no. LNRs) Resident pop.	Resident pop./ha LNR	Total LNR area (ha) (no. LNRs) Resident pop.	Resident pop./ha LNR	
Barnet	4.9 (1) 283,000	57,755	158.5 (6) 314,564	1985	152.1 (7) 356,386	2343	Large improvement since 1993. Decline after 2006 because last LNR designation was 2005 and population has increased.
Birmingham	45.1 (5) 934,900	20,729	102.6 (7) 977,807	9530	317.3 (12) 1,073,045	3382	Continuing improvement since 1993. Most recent LNR designation was in 2016.
Camden	1.0 (1) 170,500	170,500	1.45 (3) 198,020	136,566	1.8 (4) 220,338	122,410	Steady improvement from 1993 onwards. No LNR designation after 2011.
Canterbury	347.6 (5) 127,100	366	378.3 (11) 135,278	358	416.3 (11) 151,145	363	Standard achieved before 1993 in a local authority area with a small city and large rural area. No LNR designation after 2002.
Coventry	48.0 (3) 292,500	6094	216.7 (15) 300,848	1388	207.5 (15) 316,960	1528	Large improvement since 1993. A major programme of LNR designations in 2001 but none subsequently.
Derby	14.3 (2) 214,000	14,965	143.2 (7) 221,708	1548	190.8 (11) 248,752	1304	Large improvement since 1993. No LNR designation after 2012.
Dudley	181.2 (3) 300,400	1658	274.6 (7) 305,155	1111	283.0 (8) 312,925	1106	Continuing improvement from 1993 onwards. Most recent LNR designation in 2019. Standard almost achieved.
Gloucester	60.6 (3) 91,800	1515	169.5 (7) 109,885	648	158.4 (7) 121,688	768	Standard achieved by 2006. No LNR designation after 2006.
Haringey	36.2 (3) 187,300	5174	32.6 (3) 216,507	6641	109.9 (5) 254,926	2320	Large improvement since 2006. No LNR designation after 2013.
Hereford	6.1 (2) 49,800	8164	14.4 (3) 50,149	3483	15.7 (3) 53,516	3409	No LNR designation after 1995.
Islington	2.5 (1) 155,200	62,080	5.3 (3) 175,797	33,169	5.8 (3) 206,125	35,539	No LNR designation after 1996.

Urban local authority area	April 1993 ^a		December 2006 ^b		June 2021 ^c		Comments on provision ^d
	Total LNR area (ha) (no. LNRs) Resident pop.	Resident pop./ha LNR	Total LNR area (ha) (no. LNRs) Resident pop.	Resident pop./ha LNR	Total LNR area (ha) (no. LNRs) Resident pop.	Resident pop./ha LNR	
Leeds	605.0 (5) 674,400	1115	613.0 (8) 715,402	1167	704.0 (14) 751,485	1067	Large area of LNRs at 1993 assessment. Further LNR designations with six in 2015. Standard almost achieved.
Leicester	91.0 (2) 270,600	2974	153.3 (8) 279,921	1826	160.9 (9) 329,839	2050	Improvement after 1993. No LNR designation after 2013.
Liverpool	21.0 (1) 448,300	21,348	134.1 (3) 439,473	3277	156.1 (4) 466,415	2988	Large improvement after 1993. No LNR designation after 2007.
Newcastle-upon-Tyne	8.0 (1) 263,000	32,875	113.0 (6) 259,936	2300	83.5 (6) 280,177	3355	Large improvement after 1993. Decline after 2006 and no LNR designation after 2005.
Norwich	52.5 (5) 120,700	2299	136.2 (8) 121,550	892	140.1 (8) 132,512	946	Standard achieved in 1994. No subsequent LNR designations.
Oxford	2.2 (2) 109,000	49,545	6.4 (3) 134,248	20,976	6.6 (3) 151,906	23,016	Some improvement after 1993. No LNR designation after 1995.
Peterborough	51.4 (2) 148,800	2895	81.2 (5) 156,061	1922	82.2 (5) 183,631	2234	Some improvement after 1993. No LNR designation after 2006.
Plymouth	105.0 (6) 238,800	2274	146.1 (7) 240,720	1648	302.3 (13) 256,384	848	Continuing improvement from 1993. Recent designations in 2018. Standard achieved.
Portsmouth	119.0 (1) 174,700	1468	119.0 (1) 186,701	1569	119.7 (1) 205,056	1713	No change. The only LNR was designated in 1974.
Salford	0.0 (0) 230,900	–	134.9 (4) 216,103	1602	147.3 (6) 233,933	1588	Large improvement after 1993. No LNR designation since 2014.
Sandwell	30.3 (2) 282,000	9307	205.8 (9) 282,904	1375	288.6 (9) 308,063	1067	Large improvement after 1993. Standard in sight, but no LNR designation after 2000.
Southampton	14.0 (1) 194,400	13,886	14.0 (1) 217,445	15,532	47.6 (5) 236,882	4977	No change after 1993. Large improvement after 2006. Most recent LNR designation in 2017.
Southwark	29.9 (1) 196,500	6572	32.4 (4) 244,866	7558	52.8 (7) 288,283	5460	Continuing improvement after 1993 in this inner London borough. Recent LNR designations in 2017.
Stoke-on-Trent	82.0 (1) 244,800	2985	246.4 (9) 240,636	977	253.1 (9) 249,008	984	Large improvement after 1993. Achieved standard by 2006, but no LNR designated after 2006.
Telford and Wrekin	103.0 (2) 139,500	1354	194.1 (4) 158,325	816	428.9 (13) 166,641	389	Standard achieved by 1999. Continuing improvement subsequently. Four recent LNR designations.
Wakefield	313.0 (7) 306,300	979	401.5 (10) 315,172	785	643.6 (17) 325,837	506	Standard achieved by 1993. Continuing improvement subsequently. Six LNR designations in 2008 and most recent in 2020.

^aApril 1993: 68 LNRs, 2374.8 ha total area, average 34.9 ha/LNR. ^bDecember 2006: 162 LNRs, 4228.6 ha total area, average 26.1 ha/LNR. ^cJune 2021: 215 LNRs, 5475.6 ha total area, average 25.5 ha/LNR. ^dComments are in relation to standard of 1 ha for every thousand population. pop., population.

hinterlands (such as Canterbury, Leeds, Peterborough, Salford, Telford and Wrekin, Wakefield). Local authorities in very urbanised areas have to contend with high land values and strong pressures for built development.

The total number of LNRs in the 27 urban local authority areas has trebled over the last 30 years from 68 in 1993 to 215 by 2021. There have been increases in the provision of LNRs in most of the 27 urban local authority areas over the last 30 years. This may well be the result of various factors including pressure from the public and local community groups that are involved with local green spaces together with local authority planners taking account of guidance from Natural England (English Nature 1996, Natural England 2010). There are a few urban areas in this survey where no LNR has been designated since the mid 1990s (Islington, Hereford, Norwich, Oxford, Portsmouth), which suggests there could be opportunities for local community groups to take the initiative and promote the idea of new LNRs.

Designating more Local Nature Reserves

LNRs should become one of the cornerstones of the Local Nature Recovery Strategies currently proposed in the Environment Bill that are a direct outcome of the highly influential Lawton report, *Making Space for Nature* (Lawton *et al.* 2010). This report brilliantly summarises what needs to be done in four words: More, Bigger, Better, Joined. The argument is eloquently made that our approach to wildlife conservation must move from hanging on to what we already have to achieving large-scale habitat

restoration and recreation, underpinned by the re-establishment of ecological processes and ecosystem services for the benefit of both people and wildlife. Coherent and resilient ecological networks are needed where habitats are joined up by green and blue corridors extending across landscapes to allow nature to thrive. Written for England, the principles can be easily applied in different geographical areas.

Opportunities for people to come into contact with nature in their everyday lives must be a fundamental part of planning and design in urban areas. Delivering effective and economic outcomes for LNRs requires environmental managers and ecologists to work collaboratively with local authority planners and with local community groups. The planning system should be used to address areas in towns and cities that are deficient in wildlife habitats. This will provide significant positive outcomes given the demonstrated benefits to health and well-being from ensuring an easy access to nature for those living and working in urban areas (Zhang *et al.* 2017, Twohig-Bennett and Jones 2018, Lovell *et al.* 2020).

The designation of LNRs is a key driver in the delivery of an enhanced and better-protected natural environment. The provision of LNRs is expected to be included in the new Natural England Framework for Green Infrastructure Standards due to be published in 2022. Standards and targets that link people and wildlife can be powerful levers for change. Their use to influence local authority planners, landscape designers and urban developers should not be underestimated.

About the Author

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Space Enough in Lockdown? Managing the Balance in Urban Wetlands in 2020–21



Walthamstow wetlands



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Keywords: coronavirus, COVID, landscape design, management costs, monitoring, pandemic, urban nature, visitor pressure

Two wetland nature reserves, open in London since 2016, have extended the portfolio of accessible wetlands of conservation significance in the capital. Their remarkable popularity poses questions over the potential conflicts between visitor numbers and the wetlands' biodiversity interests, but also dilemmas for site management in times of continuing austerity and a growing public use of urban natural green spaces. This became especially acute during the lockdowns imposed in 2020–21.

New London wetlands

London Wildlife Trust ('the Trust') has been involved in the opening of two new wetlands in north London. This reflects a growing recognition of the need to provide more and better access to nature in many parts of London, and to enhance existing green spaces for biodiversity and the multiple benefits provided in terms of climate change resilience and well-being. The Trust manages both sites in terms of their habitats, public access and engagement with volunteers and visitors in partnership with the landowner and other partners (see Box 1). Both are predicated on attracting people – especially those who don't usually visit nature reserves – and being able to balance this with conserving and enhancing the wetlands' biodiversity interests.

Box 1. Woodberry and Walthamstow Wetlands

The Trust set out the concept for Woodberry Wetlands in 2010, bringing in Thames Water, Hackney Council and Berkeley Homes (and other partners) to enhance the reservoir for biodiversity, restore an at-risk listed building and provide access to a site that had been closed to the public since 1833. The 11 ha site was opened by Sir David Attenborough in April 2016. Walthamstow Wetlands was developed by Waltham Forest Council in partnership with Thames Water, largely funded by grants. The Trust, appointed as the delivery partner in 2014, helped shape the design and deliver community engagement activities, volunteering opportunities and conservation work. Opening in October 2017 the wetlands, covering 211 ha, has been described as the largest urban wetland nature reserve in Europe. See Figure 1.

Conservation interest

Both wetlands were of conservation interest prior to their opening to the public. Walthamstow (as Walthamstow Reservoirs) is designated a Site of Special Scientific Interest. It falls within a larger Site of Metropolitan Importance for Nature Conservation (SMI). Woodberry is part of the Stoke Newington Reservoirs SMI, adjoins The New River SMI and is considered a supporting site for Lee Valley Special Protection Area (Frith *et al.* 2021). Both support a rich biodiversity, although are primarily of ornithological interest (see Box 2).

Access

Free access to both wetlands was a core tenet of their establishment. This brought about two key challenges in their design and onward management plans. Most obviously, the first was the familiar potential conflict between people's easy 'access to nature' (which the Trust promotes) and the ecological sensitivities of that which many people seek to experience in the city. Second was how to resource this effectively, not only in influencing or 'policing' the public's behaviour (ideally

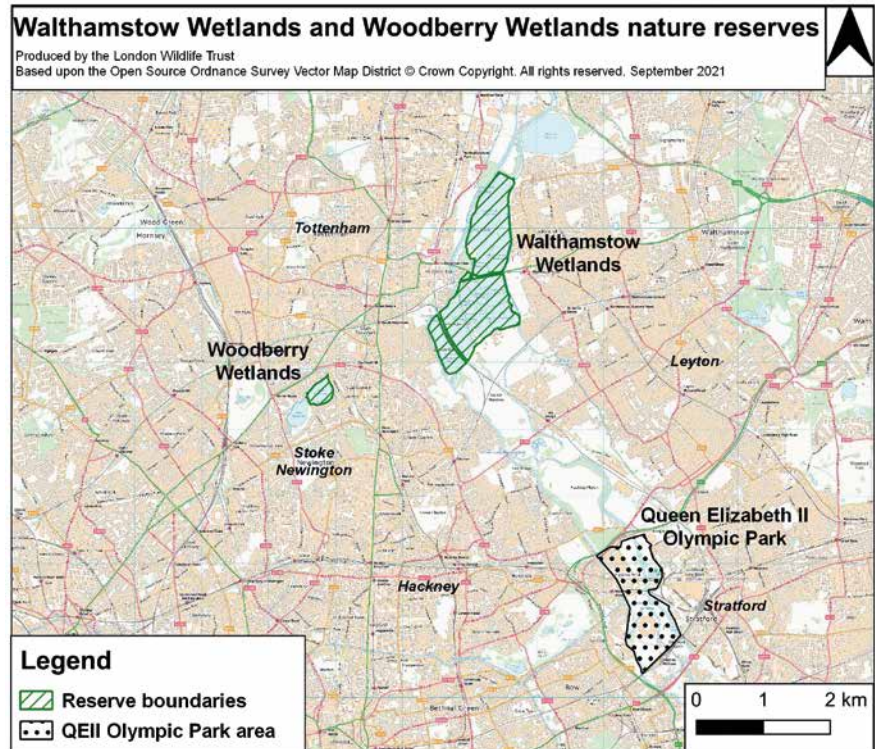


Figure 1. Walthamstow and Woodberry wetlands nature reserves.

Box 2. Wetlands biodiversity

The wetlands' prime ecological interest is for waterfowl, particularly overwintering shoveler (*Anas clypeata*), gadwall (*Mareca strepera*), tufted duck (*Aythya fuligula*) and pochard (*Aythya farina*), as well as great-crested grebe (*Podiceps cristatus*), reed warbler (*Acrocephalus scirpaceus*), Cetti's warbler (*Cettia cetti*), coot (*Fulica atra*) and gulls.

Additionally, Walthamstow is important for post-summer moulting tufted duck, breeding grey heron (*Ardea cinerea*; Britain's fifth largest colony) and winter-roosting cormorant (*Phalacrocorax carbo* ssp. *sinensis*). The site also supports breeding peregrine (*Falco peregrinus*), London's largest flock of Canada goose (*Branta canadensis*) and a good diversity of invertebrates, especially Odonata, Hemiptera and Lepidoptera, as well as mammals including water vole (*Arvicola amphibius*), weasel (*Mustela nivalis*) and European otter (*Lutra lutra*). In particular, it is a recognised birding hot-spot in London, with over 140 species regularly recorded each year by a dedicated birding group (Frith *et al.* 2021).

passively, through on-site design), but by maximising the means to resource a staff body to liaise with the public, attract and support volunteers and keep a watchful eye on the sites.

Both wetlands are open all year during the daytime. There are cycle paths across Walthamstow (linking the site with Lee Valley cycle routes), but cycling is not allowed at Woodberry (bike parking is provided at each entrance). Dogs (other than assistance dogs) are excluded from both. Ticketed events are organised throughout the year, many

of which take place out of hours. Parts of each site, mainly in and around the buildings, are closed for private hires on a few days each year.

Both wetlands are popular. The original plans for Walthamstow Wetlands estimated 180,000 annual visits by 2023–24. For the first two complete years 345,000 (2018) and 331,000 (2019) visits were recorded. In May 2020 the 1 millionth visit to Walthamstow was recorded, 30 months after it had opened. The smaller Woodberry Wetlands recorded 60,000

visits over 2016–17 (April to March), rising to just under 100,000 each year through to 2019.

Balancing acts

The nature conservation importance of the wetlands (especially the international significance of Walthamstow) meant that their design and management as publicly accessible sites had to ensure that this interest would not be undermined. From the Trust's perspective this was critical, not just for biodiversity but also our reputation and the morale of our staff and volunteers. Our experience of balancing nature and people at other nature reserves played a crucial part in the design and development phases. However, from the outset the design of both wetlands was inevitably not without its challenges (see Frith *et al.* 2021). Issues pertaining to the period over the coronavirus pandemic are described below.

'Management' includes practical conservation works (for biodiversity, access, etc.), surveys and monitoring, public engagement, school trips and other visitors, and interpretation. This is implemented through a mixture of staff, volunteers and contractors (including those commissioned by Thames Water at Walthamstow); the proportions of these differ across both wetlands and have changed over time.

Historically the Trust took on new nature reserves in the expectation that ongoing costs could be minimised by delegating management to volunteers, with limited oversight by staff. However, subsequent legal, insurance and societal changes have driven a shift towards more work being conducted by staff and contractors. Volunteers increasingly support smaller-scale works, patrolling and monitoring. Involving volunteers in reserve management is still critical (about 1500 volunteers are registered with the Trust), but realistic (i.e. higher) staffing costs are now built into business planning. A return to empowering volunteers with more responsible roles also needs to be considered.

Funding bodies now expect detailed business plans to set out how new projects can be sustained after the grant period expires; expectations rise as the grant increases in size. Woodberry and Walthamstow's funding necessitated

our plans to demonstrate this, which in both cases has involved higher staffing levels and new ventures for the Trust.

Cafés and events

The Trust secures its resources through a complex palette of incomes, and requires an increasingly entrepreneurial approach to reduce the reliance on traditional support. The Trust's first commercial cafés opened at Woodberry and Walthamstow, and despite some initial hiccoughs both are proving successful; their aim is to draw in visitors ('a view, brew and loo') and secure 'unrestricted' income that can be reinvested to support the Trust's ongoing work. But by recruiting staff with a completely different eye on the sites, more akin to a gallery, museum or festival, it potentially seeds some future mission-creep.

Most of the Trust's events (from art classes to bat walks) at both sites are now ticketed; we charge for these (an ethical dilemma when first proposed) on the basis that it's what is now largely expected, and helps to sell quality and start developing a 'supporter journey'. However, many walks and talks on the Trust's other reserves remain free.

Capturing multi-functionality?

Over the past 20 years there has been a growing policy emphasis on how urban green (and blue) spaces should ideally deliver on a range of ecosystem services, for example strengthening climate change resilience, supporting biodiversity and contributing to people's well-being. Many urban green spaces have long performed multiple functions, but these have been under-appreciated (and undervalued) until recently (Office for National Statistics 2019). Arguably the 200 or so nature reserves in London (most of which are publicly accessible) have shown how nature-rich spaces can provide a multiplicity of ecosystem services even though few have been actively captured in terms of natural capital outputs. An example was WS Atkins' assessment of the Trust's tiny Camley Street Natural Park, with an annual ecosystems services value of £2.8 million (Wansbury and Guest 2015). A broader natural capital assessment of London's public green spaces suggested an annual natural capital benefit of approximately £5 billion (Vivid Economics 2017).

The wetlands are multi-functional sites delivering many ecosystem services, forming part of the city's strategic water infrastructure, with an important fishery long being managed at Walthamstow. Both sites, until recently off limits to the public, are now visitor destinations, heavily promoted to the public by the Trust and our partners. Berkeley Homes advertise their new homes (the 'Nature Collection') as overlooking Woodberry Wetlands, and Waltham Forest Council promoted Walthamstow Wetlands from 2015 as a new public recreational space to residents and attract inward investment, an example being *The Woman Who Fell In Love With An Island*, a family-orientated trail based on Tove Jansson's Moomins in summer 2021. Thames Water are keen from a Corporate Social Responsibility perspective to provide public access to their assets and help deliver on their environmental objectives. In this respect the wetlands work hard and are worked hard. But unlocking this effectively to monetise these values in an operationally meaningful way is challenging; having the capacity to undertake a robust natural capital account of each site would be a start.

The coronavirus lockdowns

As for so many, 2020–21 has been an unprecedented period for the Trust. After almost 40 years of expounding the importance of connecting Londoners with nature, within a few months many sites received record numbers of visitors. Many peer organisations across London reported the same: people had discovered their local spaces, often for the first time, and kept returning in high numbers. The extremes of weather, with an extended warm and sunny period, followed by a wet October in 2020, meant that many parks and green spaces in London suffered damage from overuse (Office for National Statistics 2021). Dog ownership started rising, with concerns for ground-nesting birds on many sites (3.2 million households acquired a pet after March 2020; Pet Food Manufacturers' Association 2021).

However, for many site managers the financial impacts – and the Government's response measures – meant that parks and nature conservation staff were either

redeployed (especially in local authorities) or not working (furloughed). The impact of coronavirus necessitated the Trust to drastically cut costs as income streams dried up rapidly within weeks. Over 60% of Trust staff were furloughed over 2020–21, although those based at Walthamstow had to work throughout to keep the site open and safe. Many projects were put on hold.

At the wetlands there were different responses to the pandemic lockdowns. Walthamstow remained open throughout at the request of Thames Water; over 267,000 visits were recorded from March to June that year, and almost 650,000 visits to Walthamstow were recorded over 2020, with some weekends hosting over 4000 visitors. The broad and easily navigable paths through much of the site enabled easy social distancing (see Figure 2).

In contrast, Woodberry Wetlands, with a singular, much narrower path around it, was closed in the first lockdown (from 26 March 2020) to prevent overcrowding and keep staff safe. This was unpopular with regular users and after a fundraising appeal to effectively and safely staff the site it re-opened in mid-July and eventually hosted about 100,000 visitors in 2020 (close to the previous 2 year average).

High visitor numbers needed monitoring, and in some cases policing, as there was a lack of understanding of site rules, including straying from paths, dogs being brought in, swimming, barbecues and increased feeding of birds (mainly of geese). At Walthamstow an on-site security patrol (funded by Thames Water) ejected people for inappropriate behaviours, but the Trust didn't have this recourse at Woodberry. Over time some reservoir banks became eroded, necessitating the installation of fencing (Figure 3).

Volunteering had to be curtailed until the summer relaxation, and then curtailed again in the autumn, straining some relationships due to differing interpretations of the regulations (the Trust's approach was 'safety first', but some other organisations took a more flexible line). The cafés closed in the first lockdown, gradually returning back to normal by spring 2021.



Figure 2. Walthamstow Wetlands, main north-south path, February 2020 (photo: Peter Salter, London Wildlife Trust) and lockdown signage at Woodberry Wetlands, July 2020 (photo: Richard Grindle, London Wildlife Trust).



The indirect impacts of the pandemic on the Trust were profound, and continue to play out. Reliance on furlough and appeals to supporters helped us bridge the gaps, but we are not out of the woods yet. After 11 years of austerity, the future funding from 'conservation payments', either through the ELMS or Biodiversity Net Gain, is still too unclear to depend on, and probably will not yield as much as many hope, especially in urban areas. The impacts of coronavirus and planning reforms are also likely to make for an uncertain future. Green recovery funding streams will be competitively sought to help sustain existing conservation work as well as help develop new opportunities to embed the legacy of people's new-found interest in nature.

However, the really positive aspect has been the breadth of new audiences

visiting the wetlands and engaging with the Trust. On-site surveys with visitors have revealed their fascination with wetlands, and opportunities to inform them of their ecological and cultural value. We have made significant progress to better represent London's diversity in our visitors and volunteers over the past 20 years, but 2020–21 really opened the doors. Young people, dealing with a chaotic educational environment, the prospect of being stuck in at home, missing friends and with insecure employment futures, have engaged with a new vocation by their experiences at the wetlands through the Trust's Keeping it Wild programme.



Figure 3. Preventative fencing installed at Walthamstow Wetlands. Photo: Peter Salter, London Wildlife Trust.



Figure 4. Woodberry Wetlands view. Photo: James Cracknell, London Wildlife Trust.

Questions and dilemmas

Have we enough green space in our cities? The current planning standards suggest they were stretched to the limit in parts of London over 2020. Notwithstanding the need to drive forward new ecological urban greening through nature-based solutions, is it as much about quantity as quality and functionality? Should private spaces (school grounds, sports pitches, golf courses, etc.) be publicly accessible at times?

Has this public response been, for want of a better word, genuine? Has society become a more attuned to nature, or will we slip back into our ways of yore? Do social media and TV sell a false impression of what really matters to people? As ecologists I'd like to think we have this opportunity to approach the question optimistically, and if not now, then when?

COVID-19 hasn't been the only recent pressure; the climate and extinction crises have increasingly made their mark, and close to home too. How do we balance the nice and pretty stuff with the urgent and tough decisions that society has to make? Honestly, I'm not confident, but I take note of Diana Pound's call to "seize this moment" with "stubborn optimism" (Pound 2020).

Conclusions

Witnessing public interest in the wetlands (and many other Trust reserves) during the pandemic was remarkable. This was echoed in social media, responses to appeals and on-site – socially distanced – chats with visitors. It was coincidentally a beautiful spring in 2020, and the novelty of the first lockdown undoubtedly helped people

to look, listen and explore their local patch 'for exercise'. That both wetlands sit in a catchment of around 200,000 people within 4 km undoubtedly helped (despite Woodberry's temporary closure). While the spring and summer weather in 2021 weren't as attractive and consistent for outdoor recreation as much of 2020, there has still been a high visitor presence at both wetlands. Numbers by September suggested that we're returning to slightly higher pre-coronavirus levels (on track for 500,000 at Walthamstow for the year). It is reassuring that people still value their chance to connect with nature no matter how brief or urbanised it is, and that it is personally important for their well-being. It is also good that the costs to manage these numbers may return to more sustainable levels.

Whereas it is too early to be confident about the next few years for the Trust, there is no doubt that both wetlands will play a critical role, especially for their respective local neighbourhoods, which have significant regeneration underway. The wetlands have transformed the Trust, and we continue to learn from them; to make them financially sustainable without compromising their ecological interests will be key. And we will be further engaging and supporting young people to develop their ecological awareness and interests; we will need them very soon.

About the Author

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London's Useful Plants: Highlighting the Use and Folklore of Urban Plants to Inspire Conservation Interest



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Keywords: ethnobotany, plant records, urban ecology

Increasing urbanisation is changing the way people experience nature. Meanwhile, despite their importance to life on Earth, plants are ignored and undervalued in many societies and conservation initiatives. In the face of this double challenge, we discuss the potential for a focus on useful plant species to ignite and encourage plant awareness and conservation interest among urban populations. We use London as a case study to present the range of useful plants that can occur in an urban context.

Introduction

Urbanisation and the 'pigeon paradox'

London's population is projected to increase to 10.8 million by 2041 (Greater London Authority 2021). This reflects patterns of global urbanisation, with the United Nations predicting that over 60% of people will live in cities within the next 10 years. This is relevant to biodiversity and conservation in many ways, one being through the 'pigeon paradox' (Dunn *et al.* 2006), which is based on three main assertions. Firstly, with biodiversity being lost at an unprecedented rate, current conservation efforts are insufficient. Secondly, people are much more likely to care about and take conservation action if they have direct experience of nature. Thirdly, and paradoxically, with increasing urbanisation ever more

people will only experience nature in urban environments. This means that motivating conservation action will increasingly depend on people's interactions with nature in our cities.

Plant awareness disparity

Plants provide vital functions which enable life on Earth. Ethnobotany – the study of people's categorisation, understanding and use of plants – has a long history, with over 40,000 useful plants documented (Diazgranados *et al.* 2020). These are species with reported human uses, from food and fuel to those with spiritual and aesthetic values. Despite this, plants often remain unnoticed by many, providing a backdrop for charismatic fauna that many find easier to identify and appreciate. This tendency, termed 'plant awareness disparity' (PAD; Parsley 2020) (also known as 'plant blindness'), has been cited as a reason plants are often ignored in conservation planning (Balding and Williams 2016).

Evidence for PAD exists in the UK and other Western societies. This includes studies in the UK and USA showing that participants have better recollection and visual detection of animals compared to plants (Balding and Williams 2016). Certain theories purport that PAD is rooted in human biology, with our perception of plants being lower than for animals due to our evolutionary history. For example, the animate monitoring hypothesis suggests that ancestral hunter-gatherers needed to monitor animals more than plants due to their greater potential danger and importance as food. Other theories focus on visual detection, suggesting that individual plants are simply not seen, since they do not move and generally grow close to and are similar in colour to other plants (Balding and Williams 2016).

But strong bonds with plants persist in many cultural groups across the world, which are often under-represented in global conservation planning (Ro 2019, Milner-Gulland 2021). This challenges purely biology-based theories of PAD. Even if biology has a role, cultural factors are clearly also significant in determining how individuals and social groups in general notice and value plants. So how can this be used to develop greater plant awareness? And what means are there to encourage

people in urban environments to support plant conservation and environmental protection?

Motivating conservation interest

Conservation initiatives often focus on environmental education. However, evidence shows that knowledge alone may not be enough to motivate behaviours (Balding and Williams 2016). And plants often take a back seat in education initiatives, even in formal biological training.

To improve plant awareness, Balding and Williams (2016) emphasise direct experiences that highlight certain species and individuals, helping people look beyond a green blur. Meanwhile, many of the societies that have strong bonds with plants are united by the feeling of kinship between humans and plants. This is often based on the recognised necessity of plants, with associated cultural traditions and folklore encouraging their care and responsible use.

With this in mind, and in response to calls for novel approaches to both harness people's experiences of urban nature and to increase plant awareness, we suggest focusing on useful plant species. The importance of exposing people to everyday plant interactions is highlighted by Schussler, one of the authors of the phrase 'plant blindness' (Ro 2019). This already happens through our constant use of plants, such as in food, cosmetics and medicines. By highlighting these often-overlooked connections, identifying useful species in local urban areas and showcasing their stories and ecological importance, easily ignored pavement plants, street trees and park planting can perhaps start to gain new meaning. Our focus is on promoting interest in plants by highlighting their relevance to our lives, thus garnering conservation interest and engagement (Craig 2019). However, this is amidst a current trend for 'rural' activities such as local food-growing and foraging in London, evidenced through a boom in guided walks, social media engagement and the sale of relevant books (Cole 2021). As stated by the Woodland Trust, "many people seek not just to be in nature, but to genuinely connect with it.... Foraging gives us the chance to do that." However, these activities often lack a link

to conservation. As well as promoting botanical interest, a focus on useful plants could therefore also provide a route for conservation organisations to reach new audiences while encouraging responsible foraging practices, thereby helping to prevent such trends from negatively impacting urban biodiversity (Fischer and Kowarik 2020).

Useful plants in London

Distribution of useful plants

To highlight the diversity of plant stories in urban environments, we assessed the presence of useful plant species in London, based on publicly available records and the World Checklist of Useful Plant Species (WCUP). The WCUP was compiled from a range of literature, herbarium records and databases, classifying plant uses into ten 'Level 1' categories (Diazgranados *et al.* 2020). Georeferenced plant records in London were downloaded from the National Biodiversity Network (NBN; <https://nbnatlas.org>), including only species-level entries from the last 15 years (2006–2020), clipped to the extent of London's 32 boroughs.

The survey resulted in 44,403 records for 1893 plant species across the London boroughs. Of these, 950 species (over 50%) have one or more reported uses globally, with all 10 use categories represented (Figure 1a). Useful species accounted for 77% of plant records in the capital. Based on the taxonomic database of the Botanical Society of Britain and Ireland (BSBI), 453 of the 950 species are known or inferred to be native, with the remaining 497 considered alien, including invasive species (Figure 1b). This is higher than the overall ratio of alien to native plants in Britain and Ireland, suggesting that many species may be introduced for their use value. Nineteen species were of conservation concern: 12 Vulnerable, six Endangered and one Critically Endangered on the GB Red List for Vascular Plants (February 2021 revision). Useful plants with the most records were hawthorn (*Crataegus monogyna*), ash (*Fraxinus excelsior*) and pedunculate oak (*Quercus robur*; Figure 1b). These are no doubt very familiar to *In Practice* readers. However, the likelihood is that most Londoners would struggle to name them (Wyner and Doherty 2021).

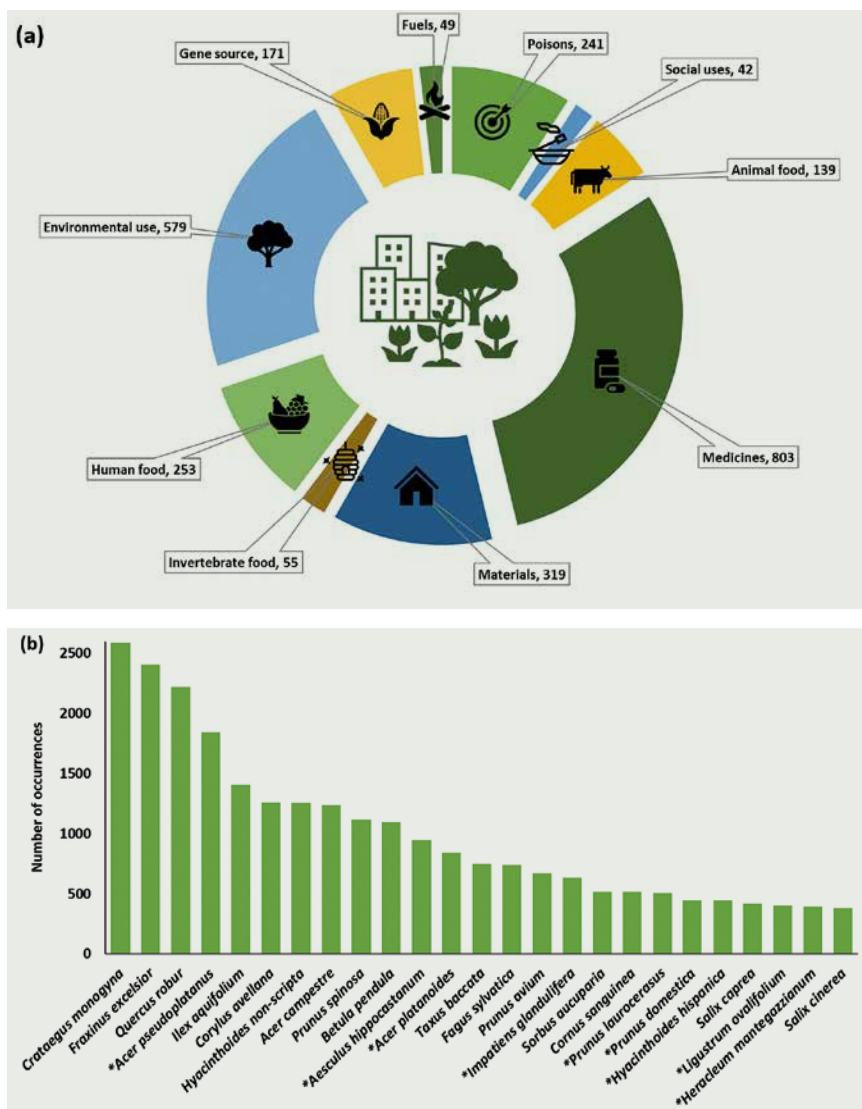


Figure 1. Characteristics of useful plants in London, showing (a) the number of species within each Level 1 use category, as per the WCUP (species can occur in multiple categories) and (b) the top 25 species in terms of number of occurrences based on NBN Atlas data. * Indicates non-native species as defined by BSBI.

Away from trees and shrubs, a plant with countless uses through history that most would surely recognise is the common, or stinging, nettle (*Urtica dioica*; Box 1). Invasive species also feature, including the Indian balsam (*Impatiens glandulifera*) and the tree of heaven (*Ailanthus altissima*). These can have negative impacts on native ecology, with invasive species being a major driver of global biodiversity loss. Box 1 highlights plant stories and uses for some of the most commonly occurring plants in London.

Data limitations

The occurrence and species numbers we present are unlikely to document the true abundance and diversity of useful plants in London. Analyses were based

on NBN Atlas records only and we relied on the WCUP alone to categorise uses. While NBN provides a valuable, open-access database of UK species we recognise that there are gaps in its plant records, with our results only intended to provide a representation of the richness of useful plants in the city.

The BSBI maintains a comprehensive Distribution Database (<https://database.bsbi.org/>), which could provide data for future analyses. However, the shortfall in data submitted to records centres is important to highlight. Conservation organisations and researchers often rely on existing records, including in urban environments, as demonstrated at the National Forum for Biological Recording Conference on Wildlife recording in the urban world (www.nfbr.org.uk/?q=conference_2021).

A government-commissioned report on biodiversity data recommended “the re-use of species data collected by consultants in transparent processes (...) potentially through new regulation. This will (...) support environmental outcomes” (Cabinet Office 2021). Meanwhile, Rowe and Clark (2021) recently published suggestions to support consultants in submitting records. As ecologists and conservationists, we should be pushing to implement data sharing wherever possible, with or without a mandated requirement.

Ethnobotany in multi-cultural London

We have focused on geographic records of useful plants on our streets and green spaces. Meanwhile, ethnobotanical studies in London directly showcase plant use in different communities. For instance, despite restricted access to traditional herbal remedies from their country of origin, migrants from Bolivia and Peru continue using home remedies, relying more on food species and available cosmopolitan plants (Ceuterick *et al.* 2011). This includes herbs occurring in London such as mint (*Mentha* spp.) and oregano (*Origanum vulgare*).

Similar patterns were found among immigrants of the Sikh religion. Traditional medicine was important for many interviewed but was changing in the face of reduced availability of ingredients and altering views in younger generations (Sandhu and Heinrich 2005). Meanwhile, many of the non-native plant species recorded in London have a rich history of uses and folklore in their native countries.

It is well documented that urban areas provide novel and varied environments for ecology which can support a range of wildlife if appropriately managed (Francis and Chadwick 2013). Ethnobotanical studies showcase high biocultural diversity too. Recent CIEEM and *In Practice* articles have discussed the under-representation of Visible Minority Ethnic (VME) and Black, Asian and Minority Ethnic (BAME) groups in conservation and ecology (Craig 2019, Williams 2020). Both authors highlighted the disproportionate number of VME people who live in inner city areas, with Craig stressing the need “to make nature relevant”, such

Box 1. Showcasing some of London's useful plants

Common nettle (L1 uses:

medicine, food, materials): while we may try to avoid *Urtica dioica* L. stings, flogging with nettles, or 'urtication', has been documented for chronic rheumatism in many cultures including Britain and ancient Rome. Its leaves are a nutritional green vegetable with many culinary uses, and remain key in Cornish Yarg cheese. There is a long history of using nettle fibres for textiles, with their common name possibly deriving from the Anglo-Saxon word *noedl* (needle). Nettle was relied on in Germany during World War 1 cotton shortages and has seen a recent resurgence as a sustainable alternative to cotton. It is associated with folklore, featuring heavily in Hans Christian Andersen's fairy tales.



Pedunculate oak (L1: animal

food, environmental use, human food, fuel, materials, medicine, poison): *Quercus robur* L. is tightly bound to the history of Britain and is the national tree of Ireland. King Arthur's Round Table was made from a single piece of oak, reflecting its timber value. Oak bark is used as a dye, while its acorns have been fed to livestock, eaten by humans during famine and even used as a charm to protect against lightning. Medicinally, oak has been used for its astringent properties in many countries, and even oak galls have been harvested.



Tree of heaven (L1 uses:

animal food, environmental use, invertebrate food, fuel, materials, medicine, poison): an invasive species in the UK, with calls for it to be listed on Schedule 9 of the Wildlife and Countryside Act, *Ailanthus altissima* (Mill.) Swingle (commonly known as 臭椿 or *chòuchūn* in China) has many uses. It even features in the oldest existing Chinese encyclopaedia, from c.300 BC. Applications include cultivation to feed caterpillars of the silk-spinning ailanthus moth, tinctures to treat cardiac complaints and harvesting its wood for furniture, charcoal and firewood.



With reference to Grieve (1982), Vickery (2019), Hu (1979) and Diazgranados *et al.* (2020).

“ Outreach and engagement that focuses on plants in local urban environments, while highlighting their uses in a variety of cultures, could provide relevance to cultural heritage and a connection to the local living world. ”

as referring to nature and biocultural knowledge in different countries and under-represented groups. Outreach and engagement that focuses on plants present in local urban environments, while highlighting their uses in a variety of cultures, could therefore provide relevance to cultural heritage and a connection to the local living world (Balding and Williams 2016, Wyner and Doherty 2021).

While this article highlights the relevance of plants rather than directly encouraging harvesting, a recent study by Fischer and Kowarik (2020) presented urban foraging as a promising tool for connecting society to nature. Their findings from Berlin suggested that foraging does not pose a threat to native biodiversity, with the general public harvesting common species such as dandelion and blackberry. Edible plant collection was undertaken by people from diverse backgrounds and the authors suggested incorporating such species in green infrastructure to further increase accessibility (Fischer and Kowarik 2020).

Aside from direct uses, plants provide many ecosystem services in urban environments. Their recreational, aesthetic and health values are recognised through the creation of parks. They also provide regulating services, such as improving air quality and local climate regulation. Broader awareness of this is needed to motivate spatial planning approaches that further incorporate green spaces sustainably (Rogers *et al.* 2015). This could simultaneously enhance habitats for wildlife, improve nature accessibility and support adaptation to urban climate change.

Final remarks

Urban landscapes were historically ignored by conservationists, with nature and ecology seen to occupy the realms of 'pristine' areas excluding humans (Francis and Chadwick 2013). The emergence of urban ecology – a hugely interdisciplinary field – has given voice not just to the unique ecological interest and disproportionately large environmental impact of cities, but also the crucial interactions of people with urban nature.

The health benefits of urban nature and issues of equitable access are now recognised at the highest levels of conservation planning. The Draft Post-2020 Global Biodiversity Framework aims to "increase the area of, access to, and benefits from green and blue spaces, for human health and well-being in urban areas" (Convention on Biological Diversity 2021). The London Plan also includes policies for urban greening and access to nature (Greater London Authority 2021). Similarly important is the need to inspire increasingly urban populations to care about biodiversity.

Making nature relatable is vital for this goal, particularly for plants, as PAD continues to limit conservation action. A focus on useful plants is one way of achieving this, highlighting their huge diversity in London and the continued importance of ethnobotany among many communities. While the trends for foraging and other rural activities in London often lack conservation links, they show a wish to connect to nature, mirrored in the global movement for National Park Cities (National Park City Foundation 2021). London was designated as the world's first, highlighting its natural heritage and providing a means to improve green spaces for a more diverse range of people. Focusing on the biocultural values of our urban plants could be an additional route for nature organisations to reach broader audiences and to develop growing the environmental awareness into conservation interest, support and action.

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It's all About *Dualchas* and *Dileab**: Gaelic Place Names and Public Engagement with Ecosystem Services

**Dualchas* means heritage; the intimate bonds that exist between the natural world, the land and its people, connecting through language, tradition and culture from generation to generation; *dileab* means legacy, also encompassing bequest and inheritance.

Figure 1. Contin's *Coille Uisge*. Photo: Phil Baarda.



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Keywords: climate change, ecosystem services, place names, toponyms

Today, we have climate heating and ecosystem collapse as genuine realities, and people are largely disconnected from their environment and do not recognise that we're intrinsically part of the natural world. The concept that nature is essential for us makes for a deeper and more urgent

acknowledgement. This need to connect people, nature, place and environment is as fundamental now as it was in distant times. And through recognition and connection comes safeguarding action. Possibly. But, how do we connect in a jostling and cluttered information space? Is it possible to cut through the bombardment of culture-

cram and constant *cause célèbres*? This article looks at some projects that get to the heart of ecosystem service valuation and climate change impacts, and reaches people in a new way: through Scottish Gaelic.

The names on the maps

I live in a small village in the Scottish highlands, which you'll have passed through – probably quite swiftly – if you've ever been on the Inverness to Ullapool road. It's called Contin, stemming from the Gaelic *Cunndainn*, meaning a confluence (of waters), which it still is. It's where the river Black Water splits and re-joins to meet the River Conon at a wide, once marshy and massive alluvial woodland, the *Coille Uisge*, the 'water(y) wood' (see Figure 1). This area is now somewhat

unremarkable grazing land, with a few isolated channels and pools, but aerial images show how extensive the swampy floodplain woodland and watery network must have been. It was once a remarkable dynamic alluvial mosaic habitat. Contin is also where the populated fertile lowlands around the Inner Moray Firth start the transition into the sparsely habited expansive thin-soiled mountains of the west. Contin is a 'confluence' on many levels, which would have been known and probably instinctively recognised by the ancient Gaels when the name of the place *Cunndainn* took hold.

It's this kind of instinctive recognition that I'm currently working on with NatureScot (formerly Scottish Natural Heritage). We, of the ecological sciences, often say that we, as humans, are an essential part of nature, dependent on what it provides. More often than not, the sentiment comes across as a glib expression that lacks a genuine grasp of the complete reliance we have. Intellectually, we (ecologists) get it, but do we (as people) truly comprehend the 'we're intrinsically bound up with nature' tagline we often promote? People – all people – did, once. For them nature, land and ecosystems were genuinely life-giving and death-defying. What's more, this was acknowledged in how our ancestors considered and regarded the environment around them.

Open an Ordnance Survey map for northern Scotland virtually anywhere and you'll see a plethora of names, mostly in Gaelic. Some are often descriptive (such as the prominent headland in Ardnamurchan: *Sròn Mhòr* – 'big (long) nose') or evocative (like *Loch Garbh Iolachan* near Strathglass – the 'loch of the rough roars or shouts', possibly of echoing deer, or of hunting, or the sound of air trapped under ice, or maybe a reference to drownings, actual or supernatural). Or, as we've found in a recent NatureScot research report (Maclean 2021a), place names catalogue ecosystem services, being a geographical lexicon of what the land produces and provides for humans.

Place names and ecosystem services

Naturally, the ancients knew all about the benefits and values derived from

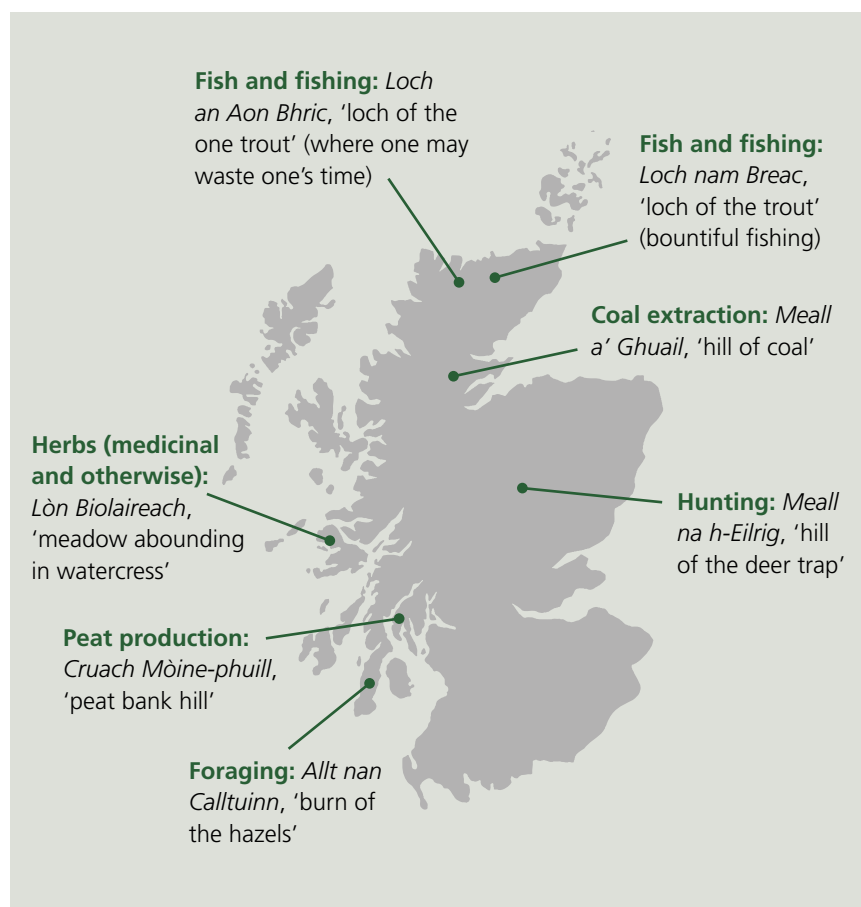


Figure 2. Map of Scotland showing place names that reference some natural resources and production in their Gaelic names.

land and its use, as these goods and services were intrinsic to survival. Predominantly, but not exclusively, the ecosystem service place names we examined depict provisioning (food, water, timber, fuel) and cultural services (recreation, aesthetic, spiritual), with a few describing regulation and support. Of the latter, there are soil-formation and nutrient-cycling references. Names with *Todhar* in, for example, are places where seaweed is collected or hauled out to dry for use as a fertiliser, or fields that are manured by penning cattle in (like Mull's *Todhar Dubh* – 'black dung field').

Not unsurprisingly, there are very many agricultural production toponyms. There's the *Cnoc a' Bhainne* in Assynt – 'hill of the milk' – that is, the hill among all the others in the locality that is remarkable for milk production (linked to transhumance and summer pasture). Similarly there are Kerrera's *Gleann a' Chàise* – 'glen of the cheese' – and Mid-Ross-shire's *Beinn nan Càbag*, the 'mountain of the cheeses' (specifically, the *càbag*, i.e. a kebbock, a whole

round cheese). Both of these reference a specific foodstuff – presumably a noteworthy or bountiful one – distinct from all the other things that livestock produce; they're not 'hill/glen of the wool, or leather'. There are literally hundreds of other examples, and Figure 2 gives a few.

It's not just *terra firma*, either, where ecosystems are noted as essential: they're in seascapes too, with the marine environment similarly populated with names. Some refer to the provisioning services of land, like *Port an Tiobairt* on the island of Jura – 'harbour of the well' – presumably being a notable place where mariners would replenish their water supplies. Some refer to navigation, like the *Sròn Mhòr* in Ardnamurchan mentioned above, which can only properly be seen as a long nose from the sea, being an obvious seamark, possibly also giving an indication of the type of tide swell and flows, and shelter.

The sea, too, is also a place of harvest, with distinct places giving more rewarding ecosystem service benefits

than others. The littoral zone, of course, has seaweed – valued as fertiliser, as well as foodstuff – particularly dulse and carragheen. Mull, for example, has *Eilean an Duilìsg* – ‘island of the dulse’. There are shellfish too, like *Rubha na Tràighe-maoraich* in Mull – ‘point of the shellfish beach’. But open water has a detailed toponymal lexicon as well. Currently under-reported, there are names like *An Creagan Breac* (a precise part of the sea around Benbecula and South Uist in the Western Isles), being ‘the craggy speckled place’ where its rocky seabed produces an abundance of lobsters.

This goes beyond simply the importance of (re-)connecting people with nature: we can potentially use this knowledge to inform rewilding or restoration projects. For example, there has been a significant number of translocations of white-tailed eagles over the last decade. Are these introductions, or re-introductions? Documentary evidence, such as place names, can show the location of former strongholds (Evans *et al.* 2012) and where golden and white-tailed eagles intersected. This is not only of licensing importance: it also indicates the degree and extent of habitat that must have been available in previous centuries, and – by extension – what today’s landscapes have lost.

Rural versus urban

Urban areas have probably lost more than most. In parallel to this mostly rural ecosystem services and place name research, we also commissioned a book, *The Place-Names of Inverness and Surrounding Area* (Maclean, 2021b), which brought the value of place and land to the heart of a city. Inverness may be a small urban centre compared with most cities across the UK, but the streets, suburbs and spaces tell a tale of historical land use and its ecosystem service value and benefits to our forefathers/mothers that which is just as revealing as its vast non-civic hinterland. For example, Merkinch is derived from *Marc Innis* – ‘horse island/meadow’ – an area valued land for grazing, specifically for horses rather than for livestock. Similarly, there’s Muckovie – *Mucamhaigh* – a field or plain specifically for pigs (*muc*). This concept of a land parcel’s specific functionality is seen in the several *doch*

“ All people once knew that nature, land and ecosystems are genuinely life-giving and death-defying. We can use this knowledge to inform rewilding or restoration projects. ”

names within Inverness’s city limits. *Doch* stems from *davoch*, which relates to the productivity of an area of land. There is *Dochfour*, *Dochgarroch* and *Dochnalurig*, being a *davoch* of pasture, rough land and a long, thin shank (*lurg*) of land respectively. These three areas presumably have the same degree of productivity and return but are of differing sizes, soil types, land forms and management regimes.

More than just a name

There’s an extra and deeper level to this toponymic research: Gaelic in its earliest writings depicts ecosystem services. In *Arann na n-Aiged n-Imda* – ‘Arran’s hunting’ – the anonymous 12th century poet extols the plenty that the island of Arran has to offer: its deer, the ripe blaeberrries in the thickets, brambles and sloes on blackthorns, hazelnuts and trout. It’s a place where warriors are nourished, where pigs are raised, where dwellings thrive; an almost-idyll where nature provides and people prosper.

While there is naturally poetic licence in literary fiction, and the details may be hyperbolic, what isn’t in doubt is that nature and humankind were bound implicitly together. Going to Arran today, you might be hard-pressed to marry the anonymous pre-medieval poetry with today’s landscape. Similarly, this is even more apparent in a small portion of land in Glen Moriston (off Loch Ness in the Highlands) and the relatively recent 18th century poem it eulogised.

The ballad *Coir’ Iarairidh* by the little known Ewan Macdonald is lyrically descriptive and also gets to the essence of what the land provides: in this case the area of the corrie (*iarairidh* (which has several possible meanings¹)). Macdonald declares this corrie is lush, “productive”. It’s “flourishing”, it yields magnificent apples which are “clustered” and “succulent”. It provides

a bounty of food of all kinds: fish, fowl, fodder. A visit to this verdant Eden today, however, shows a very different picture (Figure 3): sparse birch is all that remains in a vast expanse of unremarkable heather moorland.

Who does this engage with?

Coir’ Iarairidh is one of many song-poems collected in *A Musical Heritage of Glenmoriston* (Gauld and Langhorne 2021). It contains several examples of musical ballads and ecosystem munificence, showing the stark contrast with today’s mostly degraded upland landscapes.

This report was commissioned by the Glenmoriston community from a growing curiosity in their ‘sense of place’. It’s the beginning of something much larger: they’re planning a Bards of the Glen festival in 2022. This will feature, among other heritage and land-focused activities, the renowned musicians Munro Gauld and Ceit Langhorne – the report’s authors – performing songs about the glen, in the glen, possibly for the first time in many generations. Who would have thought a relatively unknown bard from two centuries ago could be a modern-day catalyst for change?

With no fault attributed to the author of *Ecosystem Services and Gaelic: a Scoping Exercise*, NatureScot Research Report No. 1230, for its title (Maclean 2021a), this deceptively dry-sounding report was a surprise lockdown hit. Only available online, the report was published in March 2021 and it had a gratifying 300 downloads in the first month (a typical NatureScot research report has a mere handful of hits). It was picked up by various print and broadcast media and was blogged about by the science and arts organisation *eco/art/scot/land* (see <https://ecoartscotland.net/>) – twice. Equally as gratifying is that it has stimulated collaborative discussions between NatureScot and Historic Environment Scotland, the latter being keen to work with us on several of the report’s many research recommendations.

The Place-Names of Inverness and Surrounding Area is a lovely 200 page, fully illustrated book, available free as both hard copy and online. In



Figure 3. *Coir' Iarairidh*. Photo: Roddy Maclean.

the 3 months following publication (June 2021) it was downloaded 1000 times. The media coverage has been significant: it was featured on TV and radio networks, with local and national press coverage. Around 600 copies have been posted out, and they're currently available for a small postage charge from *Comhairle nan Leabhraichean* (the Gaelic Books Council; see Resources), who regularly run out of copies. Two hard copies have been sent to each of the 35 schools (secondary and primary) in the book's area, some of which have requested more. The uptake and reaction has been genuinely remarkable.

***Bho bheul an eòin* ('from the birds' mouth')**

It's clear there has been a resonance in many ways in what these various projects have achieved, and, reassuringly, it's not just academe, agencies or people in the know that this kind of work has reached and engaged with. People seem to have connected with this slightly roundabout way of using Gaelic and its heritage to explain

the value and benefits of the natural world. We're adding another element too, that of climate change; plus, alongside Gaelic we're adding high-quality wildlife art.

Over recent years a lot of species have arrived in Scotland, often helped, to a larger or lesser degree, by our changing climate. The bearded tit, for example, was recorded for the first time in Scotland in 1972, with breeding confirmed in the Tay reedbeds in 1991. Now there's a 250-strong breeding pair population, making up to a third of the UK population. There are other birds too – such as the common rosefinch, Montagu's harrier and the cattle egret – all now, for better or worse, an established part of Scotland's fauna.

These species are so new that they don't have Gaelic names, prompting this project to be 'naming the new'. By working with Gaelic scholars and practitioners we have derived new Gaelic names for around 40 newly established species across the genera and families. Birds are well represented, but so are invertebrates, insects, marine

life, flora and even snow-bed algae. And – the third strand – they've all had world-class artworks produced (Figure 4; see www.fromthebirdsmouth.com/ for the full set).

The artwork is matched with the new names and short species/habitat descriptions, along with haiku poems, in English and Gaelic; all underpinned by the reason why they're newly arrived in Scotland: that is, climate change. As with the place names and ecosystem services, people are connecting with each of the various strands. Art leads to science, leading to language and heritage, and climate change; language and heritage link through art to climate and science. It is a coming together of disparate streams, a new confluence.

Conclusion

Back at Contin's once-watery wood *Coille Uisge* confluence, among the windswept and open rough grazing, there's a small reed bed forming around one of the more inaccessible channels: one that cattle and the



Figure 4. The bearded tit (*Panurus biarmicus*) – the moustached reed-worker – is now called *cuilcear staiseach* in Gaelic: stemming from the *cuilc* (reed) and *stais* (moustache). Artwork by Derek Robertson.

currently expanding feral pigs seem content to leave alone. As the *Coille Uisge* name and habitat throws us back into the past, a time of hugely apparent ecosystem goods, values and benefits, we're also surging from the present into the future: the confluence of then, now and next. Will this alluvial floodplain flood more frequently as the climate continues to change? Will more standing water be retained? Perhaps the tiny stand of reeds will expand and the moustached reed-worker bearded tit, or *cuilcear staiseach*, riding on climate heating's coat tails, will find its way to the *Coille Uisge* as the watery woodland mosaic re-develops. A further temporal layer to Contin's confluence connections.

About the Author

Phil Baarda CEcol, CEnv, MCIEEM is currently a land-use advisor with NatureScot (formerly Scottish Natural Heritage), and has been involved in nature conservation across the UK for 30 years. He's a (new and slow) Gaelic learner, and is about to embark on a Masters by Research looking at the narrative drama of place names.

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Acknowledgements

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Note

1. *Coir' Iarairidh* (that is, *iarairidh* with as uppercase i) could derive from several quarters. It could be the Corrie of Eric (*Iarraig*), a Norse king who was supposed to have been killed there, or it may refer to the corrie of the west shieling (*iar + àirigh*), a shieling being the temporary living quarters in the uplands where livestock were moved to in the summer. Or it may refer to an elrig – a funnel-type system to trap deer – which seems a plausible explanation following the discovery of a hitherto unrecorded stone dyke in 2021; hence *iarairidh* being a corruption of *elric* (i.e. elrig).

Bermuda: Societal Action for Sustainability and Conservation



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Keywords: biodiversity, community engagement, endemic, UK Overseas Territories

This article, from CIEEM's Overseas Territories Special Interest Group, highlights two initiatives aimed at preserving biodiversity on Bermuda. Both engage with local people to protect against damaging development and help plant native tree species.

As a UK Overseas Territory, Bermuda has contributed significantly to the UK's tally on endemic species and biodiversity in general. However, as with so many other locations around the world, biodiversity (and endemic species in particular) has suffered following human settlement and 'development'. Due to intense human activity, only very small areas of natural habitat remain in Bermuda today. Although the islands have a well-managed system of protected areas, they are one of the world's most densely populated regions, with a heavy tourist industry. However,

two stand-out initiatives pushing societal and cultural shifts in terms of conservation are designed to save those important areas that remain and reverse some of the habitat losses. One aims to galvanise financial support to purchase areas of biodiversity interest and protect them from development. The other intends to encourage volunteers to help plant native trees across the islands.

Buy Back Bermuda

Buy Back Bermuda is a campaign to save open space from development. Bermuda's landscape can be described as suburban in nature. With a population of 64,000 and land area of only 53 km², the remaining natural environment is under constant pressure from building development. In 2004, at a meeting of ECO Bermuda (a coalition of local environmentalists), members learned that 22 beach-front condominiums were proposed, requiring a pond to be filled in. The Bermuda

Audubon Society concluded that the only solution was to buy the land at the market price, but would only likely achieve success as a joint environmental initiative with the Bermuda National Trust. Buy Back Bermuda was formed to buy areas of land threatened with development using funds contributed in both large and small amounts by the public, corporate donors, non-governmental organisations (NGOs) and Government. Both the Bermuda National Trust and Bermuda Audubon Society (the two partners in Buy Back Bermuda) have Acts of Parliament that enable them to own land and regulate that land as nature reserves.

Buy Back Bermuda continues to focus on acquiring new pieces of open space as they become available. Added to that original mission, they now allocate funds for ongoing maintenance of the existing three reserves. To be considered for purchase, any proposed area must:

- be at risk of development
- have ecological value (natural habitat and biodiversity)
- offer potential to be improved and managed as a nature reserve
- provide public access.

In most cases the owners are pleased

to sell their land to Buy Back Bermuda rather than see it developed. This is especially true for those areas with some protective zoning which, because of restrictions, may not fetch top price on the open market. In addition, some areas have been owned by the same families for many generations, who are happy for the land to be publicly accessible after sale, so they can continue to visit.

The success of any project depends not only on a successful fundraising campaign but also on the support of the whole community: the general public, private business and the Government. The three projects at Somerset Long Bay East (also known as Pitman's Pond), Vesey Nature Reserve and Eve's Pond are all examples of successful campaigns. To date, about 5.5 ha of land has been purchased. The Buy Back Bermuda properties are managed by a joint management committee composed of members representing both the Bermuda Audubon Society an NGO and Bermuda National Trust. Each reserve has its own Conservation Management Plan (CMP) which lays out restoration and future management activities. The CMP is part of the planning process.

Pitman's Pond (Figure 1) is a coastal brackish pond. The land around the pond was a cow pasture until it was acquired by Buy Back Bermuda in 2005. The existing pond was excavated to enlarge it and create isolated islands for nesting birds. The perimeter of the pond was fenced to protect visiting birds. The land was then planted with a mixture of native and endemic woodland trees and shrubs, and the pond edge was augmented with bullrushes and red and black mangroves. A bird hide and dock were installed to allow visitors to view the resident and migrant waterfowl that now use the pond.

The Vesey Nature Reserve encompasses a disused inland limestone quarry, and a large tract of woodland hillside sloping down to a rocky shore on the calm waters of the Great Sound. The woodland contains relict specimens of several rare shrubs including rhacomia, *Pavonia spinifex* and the largest remaining population of the locally protected Bermuda bedstraw. Planting of rare species in the reserve has been ongoing since 2013, and it now hosts endemic species on the IUCN Red List, including Bermuda sedge (Endangered), Darrell's fleabane (Near Threatened), Bermuda palmetto (Endangered), Bermuda olivewood (Endangered) and



Figure 1. Buy Back Bermuda property Somerset Long Bay East, which includes Pitman's Pond.



Figure 2. Entrance to Buy Back Bermuda's Vesey Nature Reserve, which now hosts several endemic species on the IUCN Red List.

Bermuda cedar (Critically Endangered) (Figure 2).

Eve's Pond was a tidal salt water pond, connected via underground caves to the ocean. It was completely filled in with dredged sand from nearby Flatts Inlet in the 1940s. Buy Back Bermuda acquired the land and removed the invasive trees that had overgrown the sandy fill. A portion of the original pond was re-excavated in spring 2020 (Figure 3a). The new pond is a tidal brackish pond, as the cave connection to the ocean was not re-opened. The pond was stocked with widgeon grass and the endemic Bermuda killifish, and hosts numerous species of resident and migrant waders and waterfowl. The coastal valley around the pond has been extensively planted with native and endemic vegetation, and planting will continue. In the last year at least 19 species of indigenous plants have been introduced to the land around Eve's Pond (Figure 3b). The next steps in the restoration of this site include the installation of a bird blind, clearing of invasive trees from the adjacent hillside and replacement with indigenous plants.

Bermuda National Trust: planting native trees

The Bermuda National Trust launched a tree planting initiative in 2020 and has planted trees at Paget Marsh and other Trust properties around the island. Paget Marsh comprises 2 ha of natural green

space which is made up of a native peat marsh with a canopy of cedar and palmetto forest. The National Trust has been planting the perimeter of the site with endemic species to enhance its biodiversity and ecological resilience. The species used are those that would have been traditionally found there, but which have been removed or lost for anthropogenic reasons. The Bermuda National Trust uses various historical references including pictures, stories from elders and the remains of stumps

on site to determine where and what to plant. All of the areas we are planting were previously wooded and are part of a restorative process that will see our nature reserves transition to native and endemic strongholds.

Incredibly, 500 trees were planted last year, despite lockdown as a result of the coronavirus pandemic, to celebrate the Trust's 50th anniversary. The goal of the initiative is to offset carbon emissions while repopulating the island with native and endemic plants. The initiative is attracting support and volunteers from a range of sources including businesses, students and even the Duke of Edinburgh award scheme.

One of the target species being planted across the island is Bermuda's national tree, the Bermuda cedar (*Juniperus bermudiana*). The Bermuda cedar is IUCN Red Listed as Critically Endangered. Cedar trees have significant cultural value to Bermudians. The wood of the Bermuda cedar was historically valued for construction, ship building and furniture. It was also used for carving, boxes and firewood. The soft, red wood is still highly prized by woodworkers and the signature smell of cedar is known to most Bermudians. A cedar seedling is often placed atop Bermudian wedding cakes, to be planted by the couple.



Figure 3a. Site clearing in May 2020 at Eve's Pond, previously filled with sand and colonised by invasive trees.



Figure 3b. Dead cedars and planted cedars at Eve's Pond, September 2020.

The Bermuda cedar no longer grows in dense forests. Before its discovery and subsequent colonisation in the 17th century, much of Bermuda was covered by a forest of Bermuda cedars, Bermuda palmetto and other indigenous trees. Cedars provided a valuable resource to the colonists, and were widely planted and used for ship building in the 18th and early 19th centuries. By the mid 1830s, large areas had been denuded. A subsequent decline in shipbuilding allowed the forests to recover, only for them to be badly affected again by damage caused by introduced scale insects in the 1940s. Between 1946 and 1953, in an event known as the cedar blight, 95% of the Bermuda cedars were killed by accidentally introduced juniper scale insects *Carulaspis minima* and *Lepidosaphes newsteadi*. At that time, given that Bermuda cedar was the most dominant tree on the Bermudian landscape, the magnitude of the die off caused the island to become deforested, constituting an

ecological disaster with rippling effects that continue today (Figure 4a). Many biological control species, such as lady bird beetles, were imported to attack the cedar scale insects. In the aftermath,

dead cedars were cut and burned, removing valuable timber resources and nesting habitat for birds and homes of insects and other species. Many species that were adapted to life in the



Figure 4a. Dead cedars are a legacy of widespread deforestation in the 1940s and 1950s.



Figure 4b. Restored Bermuda cedars at Fort Scaur.

cedar-dominated forest also seriously declined, such as the native bluebird and the endemic cicada, which is now extinct. In the aftermath of the blight, many invasive plants were introduced to Bermuda in an attempt to restore tree cover quickly.

Around 5% of the Bermuda cedar population survived the insect attack, and these trees were found to be resistant to the scale. In the early 1980s coordinated efforts to propagate and restore cedars began, using seeds from these scale-resistant trees. People were encouraged to plant them in their gardens and planting in parks began. To facilitate and encourage people to plant the tree it was removed from the Protected Species Order in 2016, because the legal protection of the tree had caused people not to want to plant it. Today the cedar is Bermuda's most common endemic plant (Figure 4b). They are doing well in parks, nature reserves and gardens where invasive plants are managed and not allowed to overwhelm the cedars.

This latest initiative from the Bermuda National Trust will help continue this work, encouraging and facilitating the planting of significant numbers of this endemic tree over the coming years.

Conclusion

Bermuda's biodiversity is unique, formed by its isolated location. However, the native habitats have been dramatically altered by development, agriculture and invasive species introductions. Bermuda now has a similar population density to Solihull in the UK. Buy Back Bermuda and the Bermuda National Trust tree planting campaign are restoring important native ecosystems to the islands. These initiatives are protecting endemic species and enhancing community understanding and engagement with the unique nature on this overseas territory. Taking some radical steps, such as removing protection status from the Bermuda cedar and purchasing land for restoration of nature reserves, has allowed wildlife to flourish and people to support these initiatives.

Acknowledgements

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About the Overseas Territories Special Interest Group

CIEEM's Overseas Territories Special Interest Group was formed in 2012. The aim of the Group has been to promote the work done in the OTs, as well as the OTs themselves. The Group continues to explore ways in which CIEEM can work with, learn from and support the OTs. Do get in touch with a member of the Steering group if you would like to be involved.

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The Remarkable Recovery of Urban Badgers: Celebration and Challenges

European badger, *Meles meles*.



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Keywords: development, human–wildlife conflict, persecution, urban badgers, urban ecology

This article looks at the rise in population size and distribution of badgers as they have adapted and moved into towns and cities. Using Sheffield and Leicester as comparative case studies, we consider persecution and resulting changes in

legislation, the causes of increases, occurrence of human–badger conflicts and viability of populations under urban pressures.

Introduction

The European badger (*Meles meles*) is one of Britain's most loved and culturally symbolic native wild animals typically associated with rural environments. They are highly adaptive omnivores found in various environments, including urbanised areas.

However, in some areas 'urban' badgers can trigger human conflict from direct attacks, persecution and spread of disease to garden disruption and damage to building foundations. Their physicality and presence can result in significant and costly damage to road and built infrastructure, delays in major development schemes, and general nuisance (Harris *et al.* 1995). Proximity to human neighbours may mean noise from fighting, mating and foraging causing sleepless nights for residents (Davidson *et al.* 2008). Defra statistics show the most frequent causes of

conflict arising from the presence of urban badgers are damage to gardens (34%), damage to buildings (27%) and damage to recreational land (9%) (Delahay *et al.* 2009).

Particularly in urban areas, licence applications to interfere with 'problem setts' rose following legislation changes and enactment of the Protection of Badgers Act 1992. This legislation, aimed primarily at reducing persecution, appears to have triggered significant population increases over recent decades with urban badgers becoming more common since the 1980s (Sadler and Montgomery 2004, Roper 2010). Improved recording and data collection have increased understanding of urban badger distribution and abundance, although detailed studies are restricted to the south west and are somewhat dated (Harris 1984). There are no systematic analyses of damage caused, changes in human perceptions or conflicts. The two case studies presented here provide evidence from the English Midlands with long-term badger population data, observations on historic persecution and decline, and examination of issues generated by growing populations.

The Sheffield case study

In Sheffield, North Derbyshire and South Yorkshire, badger populations reached their nadir by the 1970s and early 1980s (Figure 1). Although maps show wide geographic spread, the reality was that badgers were thin on the ground, mostly very rare and actively persecuted (observed by one of the authors (IDR) as Sheffield City Ecologist at the time). Many farmers regarded badgers as a nuisance with locals happy to oblige by digging them out. There was a growing underground 'sport', of either 'digging' setts to remove badgers or baiting against dogs for money, or both. The latter drew diggers into Sheffield suburbs from as far as Durham, arriving at night with picks, shovels and dogs. Strongly associated with northern mining communities, the digging was in woods where badgers were reported and even in people's domestic back gardens. This led to a significant rise of concern and regional activity through badger protection groups with local Rother Valley MP Peter Hardy

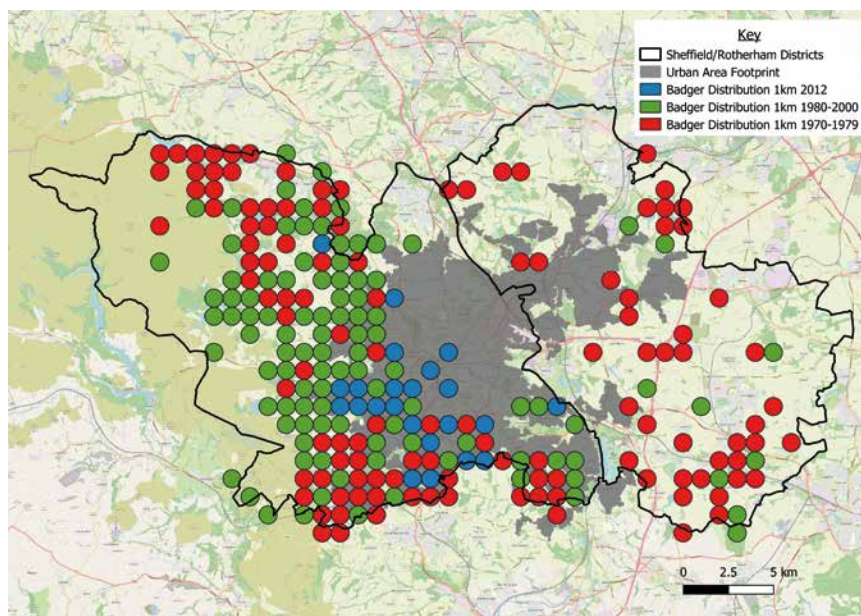


Figure 1. Pattern of Badger distribution in Sheffield 1970s–2010s (only records within Sheffield/Rotherham Districts). Note: 1970–2000 data georeferenced from Sorby Natural History Society (1964–1997).

pioneering national badger protection legislation. This began in the 1970s and culminated in much stronger controls by the 1990s. Working as Sheffield's City Ecologist in the 1980s and 1990s, IDR found the South Yorkshire Police keen to collaborate because these nefarious activities were associated with criminal gangs with large sums of money involved in betting on badger baiting. Strongly influenced by the emerging urban nature conservation movement throughout the 1980s, with slogans like "Don't badger the badger", local conservation groups formed to operate in tandem with local and regional badger groups. With remaining vulnerable setts monitored, active protection from digging was achieved by covering with concrete, chicken wire and rubble. There were also early attempts at creating artificial setts. Badgers that remained were often under boulder slopes around the edges of the Peak District and in places like disused mine adits. Other sites in woods and hedgerows were inherently vulnerable and many became unoccupied. Doncaster district, for example, was reduced to just one known active sett. An unpleasant but useful barometer to badger status is the occurrence of road casualties; in the 1980s, road deaths were still very rare (observed by IDR).

With protection and conservation, the tide gradually turned and by the early 1990s there were records from Victorian gardens in Sheffield's western suburbs and the grounds of university halls of residence. The next 30 years witnessed unprecedented population growth and colonisation or re-establishment across the geographic region. Road-kill badger carcasses became very frequent. Badgers increased hugely in the countryside and actively moved into the green suburbs with setts in woods, parks, hedgerows and gardens throughout the region. Badgers apparently used 'green corridors' along new fast roads to penetrate urban heartlands, with reports in the city centre by around 2010 and animals captured on security camera at Sheffield Midland Railway Station in 2020. In the latter case, with much local interest and enthusiasm from the general public, a badger entered the station through automatic doors during the coronavirus lockdown. However, in Sheffield's Gleadless Valley a resident faced a £2000 bill for the cost of damage to his property when badgers undermined his decking and foundations (Metro 2007), and there are other reports of damage and nuisance. Furthermore, despite an overwhelmingly positive attitude to badgers by most residents, persecution still persists (Teale 2021).

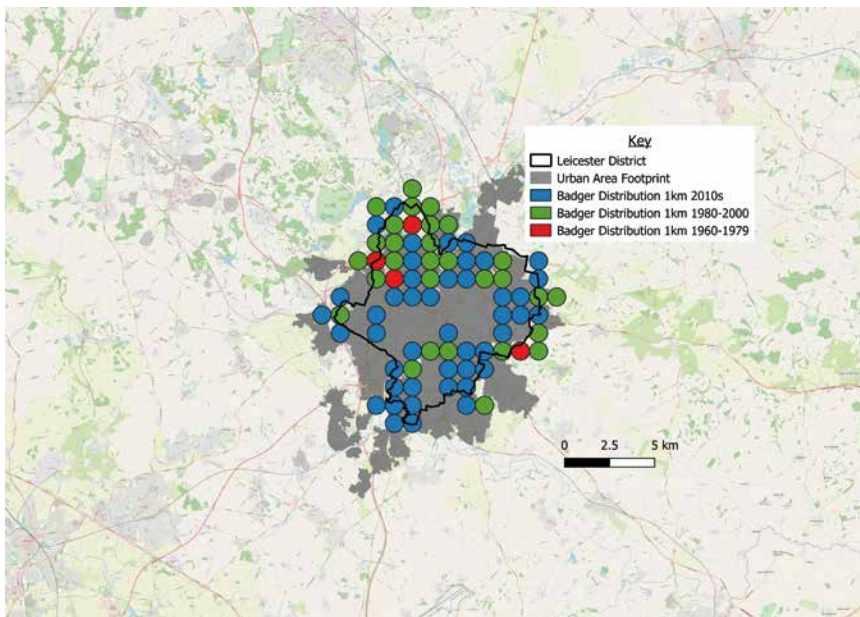


Figure 2. Pattern of Badger distribution in Leicester 1960s–2010s (no records from outside Leicester district).

The Leicester case study

Leicester is the largest city in the East Midlands at 73.3 km² and one of England's oldest cities, dating back to Roman times with settlements along the River Soar. Late 1700s industrial expansion brought canal and rail networks with surrounding villages subsumed into urban expansion.

Unlike Sheffield, records of badger persecution appear low, with no documented evidence of prosecutions available in or around the city.

Anecdotes from former Leicestershire Constabulary wildlife officers and badger group members confirm acts of persecution limited to smaller, more rural mining villages on the Derbyshire and Nottinghamshire borders.

While smaller villages were absorbed into greater Leicester, many houses with substantial gardens were built for wealthier factory owners on the outer edges. These gardens connected to churchyards, old village greens and parks. Along with railway lines and river and canal networks, these green spaces created wildlife corridors facilitating dispersal of badgers and other wildlife. It is perhaps unsurprising that some well-established setts are now located within these parks, riverbanks and railway lines, and may have been there for decades.

Many city residents were poor and malnourished, leading to the 1840s allotment movement. By the 1920s Leicester had 16,000 allotments covering 647 ha. Further land was used to supplement World War 2 rationing (ending in 1954). There are no records of badger nuisance or displacement of established setts during this period, but rising need for local fresh produce created networks of sites dotted across the inner city in otherwise hostile, densely urban environments.

Expansion of social housing and further social and cultural changes during the 1960s and 1970s triggered falling demand for allotments with many reduced in size, or decommissioned and earmarked for future development. Subsequent economic decline, closure of railways and large factories, and changing demands for new technology and service industries, led to sites with little or no disturbance, left unmanaged to re-wild naturally. This was ideal for badger sett establishment and foraging.

Alongside this, conservation groups instigated the UK's first inner city nature reserves on post-industrial land. Further protection included designating sites of importance for nature conservation, resulting in Leicester becoming Britain's first Environment City. Singled out for special praise at the 1992 Rio Earth

Summit, it provided a template for other urban areas to restore land to nature conservation. Associated surveys, monitoring and protection of green sites alongside reclamation or 'regeneration' of former tip sites in the 1990s is reflected in increased numbers and distribution of badgers across the city, with records significantly increasing from this time (Figure 2).

Leicester today has well-established setts and expanding populations close to the city centre. Many are on former industrial land and old allotment sites. However, these are now prime development plots required to support Leicester's growing human population (approximately 557,000 in 2021). The resulting issues and potential solutions are discussed below.

Table 1 summarises the key drivers for badger populations to become increasingly urbanised.

Legislation, policy and practice

Key national legislation that influences decision-makers on badger welfare and compliance with planning policies is the Protection of Badgers Act 1992 and the Natural Environment and Rural Communities Act 2006. In England, this legislation guides statutory duties of Natural England and local planning authorities in evaluating potential development impacts and issue of licences. Both authorities must consider adequacy of mitigation measures to safeguard badger populations, to protect setts or create new ones and to retain foraging territories.

Prosecutions in urban areas remain low and may reflect steady declines in badger baiting and persecution since the 1992 Act. For example, Leicester has had only one prosecution for destruction of a badger sett in the last decade (and which led to just a moderate fine).

The National Planning Policy Framework 2021 states that if significant harm to biodiversity cannot be avoided, adequately mitigated or, as a last resort, compensated for, then development should be refused. Although national case law is still limited, based on insufficient survey effort and mitigation to ensure the impacts on a population

Table 1. Summary of key drivers for increasingly urbanised badger populations.

Theme	Key drivers	Limiting factors	Facilitating factors
Supported by suite of studies/literature	Urbanisation of previously rural setts*	No	Yes: relic setts become enclosed by urban development
	Existing urban populations increasing*	No	Yes: established populations in urban areas, suitable undisturbed habitats
	Active badger colonisation of urban areas*	No	Yes: dispersal routes via green and industrial infrastructure facilitate urbanisation of rural badgers
Legislation and policy	Legal protected afforded to badgers circa 1992	No	Yes: reductions in historic persecution and duty to protect badgers
Land use	New roads and infrastructure	Yes: increased badger mortality from road kills may limit populations	Yes: linear green infrastructure/routes from new roads increase permeability
	Historic land use: industrial and grey infrastructure with urban green infrastructure (allotments)	Yes: increased urban development pressures limit viable habitat	Yes: badgers favour former industrial land/allotments, which provide refuge from urban encroachment and facilitate dispersal
People/society	Local badger and conservation/naturalist groups	No	Yes: promote conservation and public liaison/advice on ensuing issues with setts to increase local viable populations; increased recording and knowledge of local setts; monitoring
	Perceptions and tolerance of badgers by householders	Yes: limited tolerance where badger activity are acute/damaging, e.g. sett construction	Yes; badgers generally tolerated by residents and encouraged into gardens via supplementary feeding; can result in conflict between neighbours
	The role of ecologists and environmental managers	No	Yes; protection/conservation by local government ecologists enforcing legislation in planning and in-house service areas; increase use of consultancies for survey and licence applications; significant increase in data recording

*Referred to as the “three processes” responsible for increasing prevalence of badgers in UK urban environments (Roper 2010).

of badgers would not be significant, in 2020 Leicester’s planning authority won an appeal to overturn a refusal for a single dwelling of backland development.

Conflict is inevitable where land is at a premium and where, for example, disused allotments have become safe havens for badgers. Recent renewed interest and plans to reinstate allotments for sustainable food production can potentially change this and so displace badgers. Policy conflicts may arise with advocacy for allotment growth to focus on food production, conflicting with badger conservation. Achievement of policy targets while resolving conflict on the ground requires diplomacy to negotiate complex demands for space in our growing cities.

Increased demands for housing, schools and employment place pressure on re-wilded brownfield sites. Development is perhaps the greatest challenge in badger sett and habitat conservation. Protection relies on legislation, planning and local policies. Badger setts and the level of required mitigation may render some proposed developments unviable and safeguard green spaces. In other cases, where on-site *in situ* protection may not be possible, great efforts can be made to accommodate badgers elsewhere in strategic development plans.

Local plans, supported by evidence-based Biodiversity Action Plans and Green-Blue Infrastructure Strategies, provide support for policies on biodiversity, green networks and emerging Biodiversity Net Gain principles. Although not referring to

specific species, there is usually an overall objective to promote wildlife conservation and create better-connected Nature Recovery Networks. Enforced by the Environment Act, this requirement may help secure enhanced badger protection.

“ Development is perhaps the greatest challenge in badger sett and habitat conservation. Protection relies on legislation, planning and local policies. ”

Conclusion

A number of key issues emerge from the Sheffield and Leicester case studies:

- Alignment of national and local policies with wider strategic approaches to badger protection and conservation is necessary to avoid issues arising from growing populations and dispersal, and potentially more frequent and serious human–wildlife conflicts.
- Where badgers are affected by development, suitable and sustainable mitigation measures require skilled ecologists and other environmental managers who recognise often complex interconnected issues affecting urban badgers. These measures can be enforced by local conservation and green infrastructure polices and awareness-raising to alter public perceptions.
- Current constraints in local authority funding lead to a lack of resources and expertise, often exacerbated by staff changes, leading to serious issues in translating visions and strategies into practice.
- Impacts on residents can be positive and include feeling close to nature and positive mental well-being, so damage and nuisance are generally tolerated, welcomed and encouraged.
- Negative impacts include nuisance caused by badger noise, fighting, mating and foraging. Physical damage to property resulting from burrowing can be significant and serious in urban areas, ranging from destruction of fences and disruption to gardens, to costly damage to roads and building foundations caused by sett digging.
- Small-scale disturbance from badgers, for example in back gardens and allotments, may trigger neighbour–neighbour disputes when badger territories cross boundaries of householders with differing attitudes.
- Large-scale infrastructure can be delayed with associated costs if surveys, permissions and licenses were not factored in and implemented effectively.

What does the future hold?

How people and urban badgers co-exist is a fascinating and emerging issue; the two case studies demonstrate remarkable growth in urban and peri-urban populations. However, problems clearly exist. If urban badger numbers continue to increase and human pressure for city dwelling rises, conflicts may grow and become more acute. This may demand solutions from professional ecologists and other officers in national agencies and local government, and from local conservation groups. The challenges will be affected by changing public perceptions in the face of conservation and animal welfare, and of an increasingly urban society.

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Badger Dung Pits as a Seasonal Food Resource for Mammals and Birds: Implications for Urban Surveys

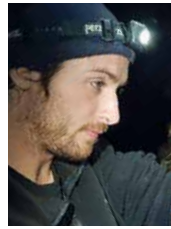
“ Birds and small mammals were noted feeding in and removing material from badger dung pits. This has implications for the efficacy of badger surveys, particularly in urban areas where small mammals may be more abundant. ”





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Keywords: bait marking, foraging, mammal behaviour, Mustelidae, survey efficacy, urban ecology

For many professional ecologists, badger activity and bait marking surveys are part of daily life, but the contents of badger faeces are seldom considered to be a contributing factor to the efficacy of such surveys. During a monitoring study of a group of badgers at an urban site, incidental observations were noted of birds and small mammals feeding within and removing material from badger dung pits. In response to these observations, camera traps were deployed at dung pits for 10 weeks in 2017 to document the nature, timing and frequency of this behaviour. We discuss the study findings and their implications for the efficacy of badger surveys, in that dung pits being emptied would result in false negative results in surveys, particularly in urban areas where small mammals such as brown rat are likely to be more abundant.

Introduction

The diet of the Eurasian badger (*Meles meles*) changes throughout the year as the species exhibits behavioural plasticity with regard to foraging, switching from a grain-based diet (where available) in summer to a largely fruit- and worm-based diet in autumn (Cheeseman and Neal 1998). Their digestive systems do not effectively process cellulose, suberin or lignin (Cheeseman and Neal 1998) and, as such, undigested plant material can remain in faecal matter. Such material represents a readily available potential food source for other species that is frequently renewed and deposited in a predictable place, as badgers will re-use dung pits or latrines persistently (Roper 2010). This predictability is the rationale for the use of bait marking to analyse badger territories: bait (usually comprising peanuts and syrup) is provided, into which are mixed small, indigestible plastic pellets of varying colours. Subsequent surveys for the presence of the pellets in dung pits indicate the territories of different social groups of badgers, and these data are then used to inform mitigation schemes and conservation efforts for the species.

From 2014 to 2017 a social group of badgers at an urban nature reserve in the West Midlands was the subject of a camera-trap monitoring scheme. Following observations in 2017 of birds and small mammals feeding within and removing material from badger dung pits, the cameras were turned to the dung pits and latrine areas for a 10 week period (corresponding to ISO weeks 35–44) to film and document the behaviour. This pilot study was undertaken at a single site over a single season, and further study is required to determine the prevalence of the behaviours observed in different habitats and in other seasons of the year. The study site was a 13 ha Local Nature Reserve situated in a fully urban context. The setts comprised a main sett (six entrances), an annex (two entrances) and several outliers and subsidiaries supporting a single social group of badgers of approximately 13 individuals prior to annual dispersal (Hughes and Brown 2017), which is a large group typical of urban badger setts (Roper 2010). Classification of setts follows that of Kruuk (1978) and Thornton (1988).

The survey

Bushnell HD Aggressor E3 Low-glow Trophycam infrared (IR) cameras were deployed facing either individual dung pits or latrine areas at a distance ranging of 1–2 m. Dung pits for the study were selected based on known recent use (i.e. those which badgers had used in the previous week, based on field observations). Cameras were placed with no overlapping fields of view, set to record 20 s videos with a 3 s delay. Cameras were checked weekly as per guidelines of a 2 week checking schedule with an increased frequency in areas of high human activity (Ancrenaz *et al.* 2012). The survey comprised a total of 296 trap days (with each trap day beginning at 00:00:00 h and ending at 23:59:59 h). For each time the cameras captured footage of an animal, the date, time, species, number of individuals and behaviour were recorded. Behaviours were classified using an ethogram (Table 1) as being either latrine-associated behaviours (LABs), comprising investigating, harvesting, toileting and scent marking, or non-latrine-associated behaviours (non-LABs), comprising commuting, foraging, caching and camera interaction.

Limitations

When triggered, the IR cameras used produce an audible click, which has been demonstrated to be detectable by mammals (Meek *et al.* 2014), possibly causing mammals to alter their behaviour. Some Mustelidae are able to detect light with IR wavelengths of up to approximately 870 nm (Newbold and King 2009). The cameras used for this study use IR light of 850 nm and so are within this detectable range. A constraint to the study is the small sample size, which took place at a single site used by a single social group. Further study is required to ascertain whether this behaviour can be readily observed in other urban areas, agricultural areas and non-anthropogenic habitats.

Findings

Animal activity, by nine mammal species and 12 bird species, was captured by cameras a total of 954 times during the study. Non-LABs accounted for 77.8% of recordings and LABs for 22.2% of recordings (Table 2). Toileting occurrences were recorded 17 times, with 11 of those attributed to badgers and the remainder being red fox (*Vulpes vulpes*; $n = 4$), dunnock (*Prunella modularis*; $n = 1$) and domestic cat (*Felix silvestris*; $n = 1$). LABs were then examined in detail. Harvesting of material accounted for 28% of LAB triggers. Of those, 82% were by mammals, with the majority (77%) by brown rat (*Rattus norvegicus*; Table 3).

There was variability in harvesting behaviour (Figure 1) with harvesting representing 21, 30 and 17% of triggers in ISO weeks 35, 37 and 38, respectively. A reduction in both toileting and harvesting activity during week 36 coincides with camera failure at the latrine area in proximity to the main sett, so any behaviours were likely missed during this week at that camera location. Lower levels of harvesting (less than 5% of triggers) took place during weeks 39–42, increasing again in weeks 43 and 44 to 6 and 7%, respectively.

Activity after toileting

Activity levels (all behaviours by all species) underwent a significant increase ($\chi^2(11, N = 21) = 17.225, p = 0.03$) in the 24 h period following toileting events (Figure 2), with subsequent reduction in activity in the following 24 h period down to a baseline of below 10 triggers per day over a 21 day period at the main sett. The majority (80%) of badger toileting activity took place between 03:00 and 05:30; the majority (85%) of harvesting activity by rats took place between 08:00 and 09:00. On average, harvesting commenced between 2 and 6 h after deposit of faeces and persisted until up to 9 h after deposit, with the majority of harvesting happening in 'events' with multiple trips taking place to plunder a dung pit for faeces until the food resource was depleted, with subsequent investigatory trips. During one such event, 28 separate trips were recorded by an adult male rat (presumed to be a single individual),

Table 1. Ethogram of behaviour categories and definitions (all species).

	Behaviour category	Comments
Non-latrine-associated behaviours	Commuting	Uninterrupted movement through camera field of view, showing no interaction with dung pits, immediate environment or camera
	Foraging	Behaviour associated with food-seeking
	Caching	Burying of food items
	Camera interaction	Direct interaction with camera trap
Latrine-associated behaviours	Investigating	Interaction with a dung pit not seen to be associated with toileting, squat-marking, eating or stealing from it
	Harvesting	Foraging within a dung pit, eating within pit and/or carrying away faeces
	Toileting	Urinating or defecating on or in a dung pit
	Scent marking	Squat-marking or spraying for purposes of olfactory communication

Table 2. Behaviour breakdown (%).

	Behaviour	Activity
Non-latrine-associated behaviours	Commuting	45.28%
	Foraging	26.94%
	Caching	4.40%
	Camera interaction	1.15%
Latrine-associated behaviours	Investigating	13.84%
	Harvesting	6.29%
	Toileting	1.47%
	Scent marking	0.63%
Total		100%

Table 3. Breakdown of harvesting behaviour by species.

	Behaviour	Activity
Birds	Magpie	12%
	Chaffinch	2%
	Dunnock	2%
	Wren	2%
Mammals	Brown rat	77%
	Grey squirrel	3%
	Wood mouse	2%
Total		100%

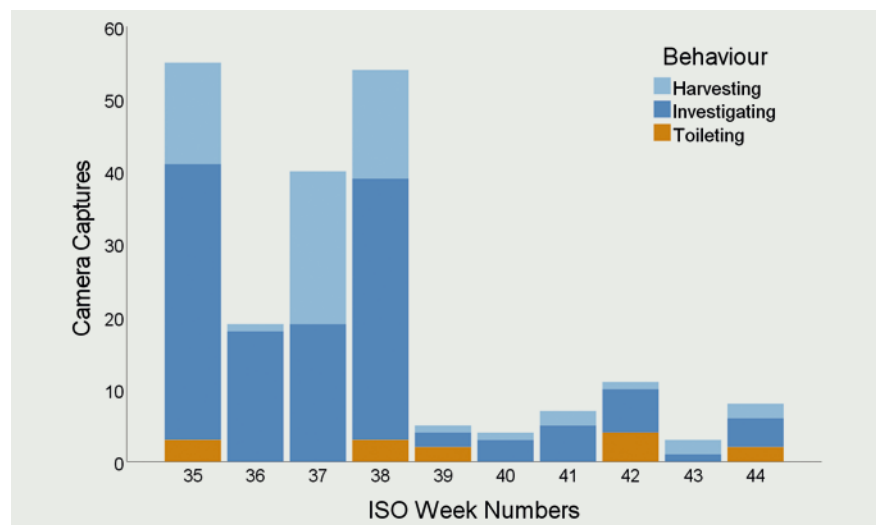


Figure 1. Camera-trap captures of latrine-associated behaviour per week of the year. Scent marking has been excluded as it is not directly associated with the observed harvesting behaviour.

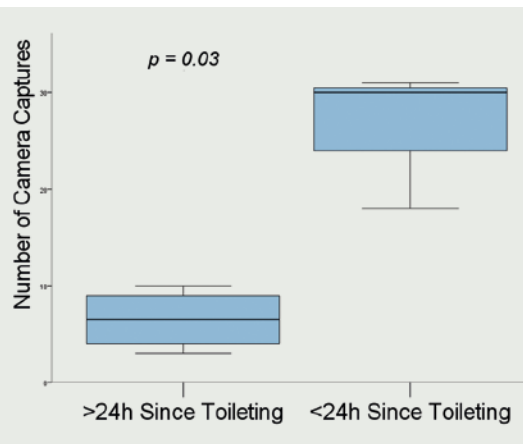


Figure 2. Comparative activity levels following toileting events. Bars show the upper and lower quartile ranges for data.

which, after a deposit by a badger (Figure 3a), was recorded carrying away entire faeces (Figure 3b), emptying the dung pit of all solid faeces.

Implications for survey efficacy

Surveys for the presence of faeces in badger dung pits are typically used as an indication of badger presence and activity (Reynolds and Harris 2005), social group size (Wilson *et al.* 1997) and territory (Delahay *et al.* 2000). The findings of this study indicate that the efficacy of badger activity and bait-marking surveys could be adversely affected by the harvesting behaviour exhibited predominantly by brown rats as described here, particularly in incidences where entire faeces are removed, or dung pits are emptied. This could result in false negative results of badger activity and subsequent under-mitigation.

Harvesting behaviour is likely to be an increased risk in environments where supplementary food sources are available (particularly in urban areas where feeding by wildlife takes place, such as in this study site) and in agricultural environments (where crop growth, harvesting and storage takes place), which are more likely to support larger populations of rodents than natural or semi-natural habitats. Availability of supplementary food sources may also indirectly affect the prevalence of harvesting behaviour due to its influence on the variability of badger diet and, consequently, the content of badger faeces. Harvesting behaviour is also likely to be more



Figure 3. (a) Badger defecating into a dung pit at 04:42. (b) Brown rat harvesting the faeces at the same dung pit 4 hours later.

prevalent at certain times of year, such as in late summer when the diet of badgers is largely grain-based compared with a largely fruit- and worm-based diet in early autumn. The autumnal dietary change would reduce the abundance of grains in faeces, making the dung pits a less lucrative food resource, and would also increase the water content in the faeces, making harvesting and removal of material more difficult.

It is worth noting that although most high-end, passive IR sensors can detect animals as small as 100 g within 2 m of the sensor (Ancrenaz *et al.* 2012), triggers of such cameras to detect stoats (*Mustela erminea*) have been documented as having at most an 80% success rate, depending on the animal's speed (Glen *et al.* 2013). This study placed camera traps at an average range of 1–2 m, and as the stoat is an appropriate analogue for brown rat by weight (Mammal Society 2017), it is likely that the level of rat activity around

latrines and latrine-associated behaviour has been underestimated in these results.

Mitigating the effects

Standard bait-marking methodology (Delahay *et al.* 2000) suggests an optimal survey period for bait marking of February–April, and a second survey period in September–October. Harvesting behaviour is more likely to take place during times of the year when faeces contain grains and are more solid, such as September. Conversely, it is likely to be less of a constraint in spring surveys when grains are less readily available, and by late October when the badger diet has switched to comprise more earthworms (Roper 2010). Another factor is that the provision of bait itself (peanuts) may trigger an increase in harvesting activity and may also alter the viscosity of faeces. As such, there is a risk of harvesting behaviour at any time of year. Current protocols suggest placing bait in late afternoon to reduce the

consumption of bait by diurnal, non-target species, but there are no times stipulated for checking of latrines (Delahay *et al.* 2000), which is typically undertaken at the same time as the visit to place bait. The results of this study indicate that there is a deleterious effect of harvesting on survey efficacy. Further study is required, but should this behaviour prove to be widespread, it could be mitigated by a simple adjustment to survey timings: that is, by undertaking checks of latrines as early as possible (surveys to be completed prior to 08:00 but ideally sooner to account for seasonal variation) in the day to maximise the chance of finding faecal matter in dung pits, particularly if undertaken at times of year when the badger diet is grain-based, or in more urban areas. When undertaking bait-marking surveys, a simple adjustment to survey timings (checking dung pits in early morning and returning to place bait in late afternoon) could potentially mitigate the negative effects of harvesting behaviour on survey results. Split-method surveys such as this are already the norm for other taxa such as great crested newt (*Triturus cristatus*) and could be incorporated as best practice for badgers. Notwithstanding, the implications on cost and resources are notable, as it would increase the number of visits required to each survey site.

A note on zoonotic disease

Should the behaviour documented in this study prove to be widespread, there may be implications to consider regarding disease transmission. For example, bovine tuberculosis (caused by *Mycobacterium bovis*) has been documented to be present in both brown rat and wood mouse (Little *et al.* 1982, Delahay *et al.* 2001) and rats are known to carry other diseases that are transmissible to cattle (Ward *et al.* 2006). While it has been acknowledged that rats are a potential vector for transmission of *M. bovis* in agricultural landscapes due to the frequency of their contact with livestock and contaminated food stores (Delahay *et al.* 2001), their potential to transmit diseases between social groups of badgers in anthropic environments is little understood.

Conclusion

The results of this study indicate that there is potential for a deleterious effect on badger survey efficacy resulting from the observed behaviour of rats harvesting contents from badger dung pits/latrines and causing subsequent false negative results. Notwithstanding, the data presented here were collected at a single, urban site used by one social group of badgers in a single season. Although the results are compelling, the sample size is small. As such, more research is required to determine (1) how widespread harvesting behaviour is, (2) whether it is more prevalent in rural or urban areas and (3) which times of year the behaviour is more prevalent. Further research should ideally include study sites along an urban–rural gradient and should encompass the full survey season of February–October. Should further studies indicate that harvesting behaviour does indeed represent a constraint to the efficacy of activity and bait marking surveys, consideration should be given to methods for mitigating its effects. These may include modifications to survey timings as described above, which in themselves represent logistical and financial implications for ecologists.

Supplementary media

IR footage of the behaviours reported above can be found at the following URL: www.youtube.com/playlist?list=PLqAMqVCC19FU0oo9sUq8h2IY84j_opMu-

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The BTO Acoustic Pipeline: An Example of How the Field of Acoustic Monitoring is Developing

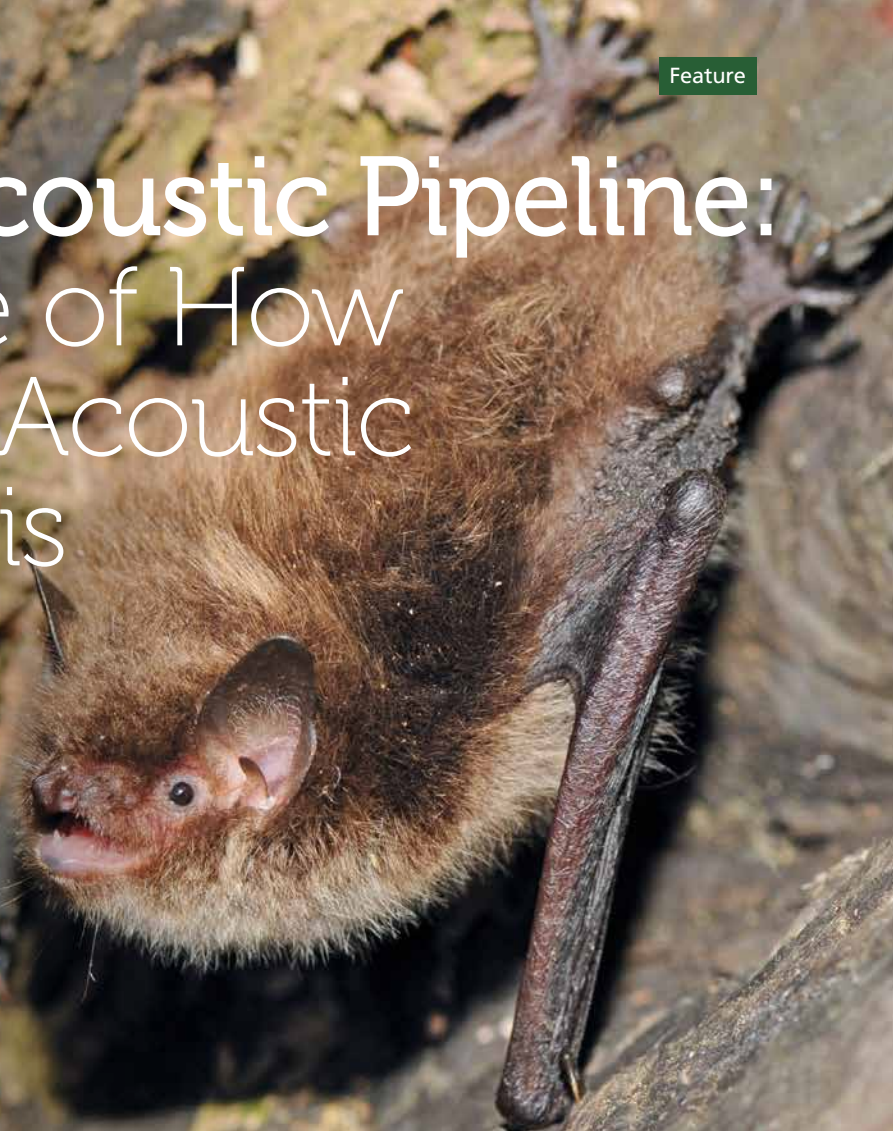


Figure 1. Daubenton's bat. Photo by Ján Svetlík.



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Keywords: bats, impact assessment, Orthoptera, urban planning

Robust data on wildlife populations, their status and distribution are needed to inform land management and development decisions. Such data are often lacking for taxa that are cryptic, nocturnal or occur at low densities, attributes that may be overcome through the

use of acoustic monitoring. As this article reveals, technological innovations and advances in our knowledge of the sound identification of different species are providing opportunities for acoustics to be used more widely by ecologists and environmental managers working across a suite of project types and species groups.

Introduction

Our ability to develop biodiversity-friendly planning is contingent on having robust data on wildlife populations, both those present prior to development – which can be used to inform planning choices – and those present after the development has been completed – which can be used to assess whether promised positive biodiversity outcomes have been achieved. Securing robust data for some taxonomic groups is more challenging than it is for others (Plummer *et al.* 2020), but the development of approaches, such as acoustic monitoring

and the use of environmental DNA, is helping ecologists and environmental managers to address this. With these, it is not just our ability to detect individual species that is changing, but also the ease with which such data can be collected and processed, both at the scales required and within the timescales and budgets available. This article examines recent advances in the use of acoustic monitoring and highlights how the British Trust for Ornithology (BTO) Acoustic Pipeline offers opportunities to secure robust data in an efficient and cost-effective manner.

The use of acoustics

Ecologists and researchers have a long history of using sound to study and monitor wildlife populations, from the identification of birdsong by ear to the deployment of static detectors to record the activity of bats. This latter approach has proved to be particularly effective for species that are difficult to study through other means, because they are cryptic, nocturnal or occur at low densities. Advances in acoustic monitoring technology, coupled with

the development of more sophisticated data processing and species identification, bring two advantages:

1. detectors can be left *in situ* for a defined period of time with the potential to collect extensive data with minimal effort
2. acoustic monitoring is now an affordable option for professional ecologists and equally professional but unpaid volunteers (such as bat groups).

The use of these technologies has proved particularly valuable in increasing our understanding of the distribution, status and activity of bats (Newson *et al.* 2015, Newson and Bethinussen 2018). The diversity of bat species present in the UK, coupled with their widespread distribution and position at a high trophic level make them valuable indicators for assessing changes in environmental quality, such as those associated with development activities. In the past, work at larger spatial scales has tended to rely on presence-only data, which have often failed to address temporal and spatial variation in bat

activity. However, the use of passive acoustic devices, and the semi-automation of the analysis of the resulting sound files, is facilitating the large-scale representative monitoring of bat distribution and activity. Such development has also enabled a citizen-science-based approach to delivering large-scale standardised acoustic monitoring of bat populations (Newson *et al.* 2015) and the collection of data on other taxonomic groups, including bush-crickets (Newson *et al.* 2017a), birds (Gillings and Scott 2021) and terrestrial small mammals (Newson *et al.* 2020).

Data collection and processing

The use of full-spectrum detectors, which can be left unattended to automatically trigger and record calls, has greatly increased the opportunity to collect information on bats and other taxa for assessment, monitoring and research purposes (Zamora-Gutierrez *et al.* 2021). Full-spectrum bat detectors, such as Wildlife Acoustics' Song Meter SM4BAT FS, are widely



Figure 2. Dark bush-cricket. Photo by Mike Toms.

used by ecologists and researchers for bat monitoring, while other devices, such as the Echo Meter Touch, have a wider appeal and are used by bat enthusiasts at any level. The low-cost AudioMoth, developed around the Silicon Labs Gecko processor by the Open Acoustic Devices Team, is being widely used by those interested in monitoring nocturnally migrating birds (Gillings and Scott 2021) as well as for a number of other environmental and biodiversity applications, including work on bats. All of these devices have the potential to generate very large volumes of data, which need to be processed.

A key component in processing the data collected by acoustic monitoring devices has been the development of acoustic classifiers; these can save the user considerable time in carrying out a first analysis of recordings and can be followed up with further auditing of particular results. These classifiers require an extensive reference library of recordings, collected from known species and containing the range of vocalisations likely to be encountered in the field (Newson *et al.* 2020). Many thousands of recordings are needed for each species for the classifier to perform well. Building a classifier then requires a range of different measurements to be extracted from the library calls; from these it is then possible to identify those which are most useful for distinguishing or illustrating differences between species. By way of example, Newson *et al.* (2017a), working on the sound identification of bush-crickets (e.g. Figure 2), used 150 different call measurements and over 17,000 known species recordings to build classifiers that could be used to identify calls from unverified bush-cricket recordings.

The acoustic classifiers use machine learning approaches (Newson *et al.* 2017a, Gillings and Scott 2021) to detect and identify calls. The algorithms assign possible identifications to each recording, which are often accompanied with a probability that reflects the certainty in the classification being correct. This approach has been supported by the development of novel methods (Barre *et al.* 2019) that allow for more robust and objective measures of error in species identification to be produced.

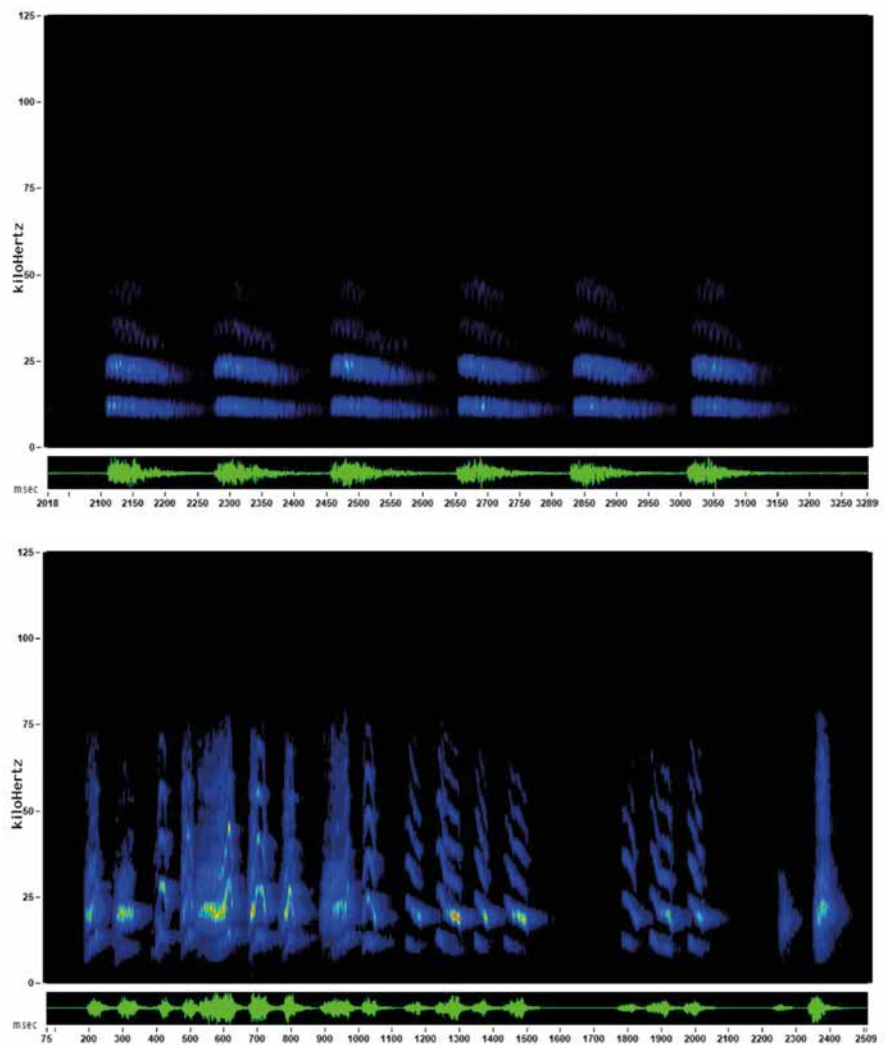


Figure 3. Spectrograms of (a) common shrew, showing four visible harmonics, and (b) pygmy shrew, showing sloping calls and multiple harmonics.

Newson *et al.* (2017a) demonstrated that valuable information on nocturnally active bush-crickets can be collected alongside data on bats. Bush-crickets are poorly recorded in their own right, but being able to identify them automatically in recordings can save a huge amount of time for bat workers, reducing the amount of time needed for auditing recordings during the 'bush-cricket season' from July to October. Small terrestrial mammals, including species of conservation interest such as the hazel dormouse (*Muscardinus avellanarius*) and harvest mouse (*Micromys minutus*), are also commonly recorded as 'by-catch' during bat surveys. However, it is only very recently that the potential of bat surveys for improving our understanding of small terrestrial mammals has been realised. By including bat echolocation calls, bat social calls and feeding buzzes, together with the calls of small

terrestrial mammals (e.g. Figure 3) and bush-crickets, all in the same classifier, there is huge potential for the industry to improve the identification of bats while enabling the safer elimination of non-bat calls. This is the approach adopted by BTO's Acoustic Pipeline (www.bto.org/pipeline).

New approaches to project and data management

One of the challenges facing ecologists and environmental managers when considering the use of an acoustic monitoring is the very significant quantities of data collected. Passive acoustic recorders capture a suite of sounds, many of which will be from species (or things) other than those being targeted. All of these sounds need to be reviewed so that those from the target species can be extracted and identified. While machine learning approaches lend

themselves to this process, there remains the often tricky issue of data volumes. This is where data processing in the cloud can be beneficial.

Projects may involve the use of multiple contractors or fieldworkers, each tasked with collecting the recordings and, in some cases, processing them to identify the species encountered. This can make it difficult to standardise the approaches used; for example, individual contractors may have different equipment, or the same equipment but with different settings. It can also be difficult to secure the quick return of the data collected because many ecologists process sound files later in the year, outside of their busy field season; they may also use different software for carrying out a first analysis of recordings and for viewing spectrograms, where the potential for differences in sound identification skills between workers can complicate matters further. The use of the Acoustic Pipeline addresses many of these problems by adopting standardised analyses of the uploaded files, and project management options that enable project owners to see summaries of the results soon after they have been collected and uploaded, alongside detail on who has collected and submitted recordings. The Pipeline also provides

an option for recordings from a large project to be stored together and pulled back at the end of the survey season, for later auditing. Some example spectrograms are shown in Figure 3.

Acoustic monitoring data may be collected during work to assess the potential impacts of proposed developments, where they are used to identify the presence of particular species (invariably bats) and their distribution across a site. These data are often then summarised in a report before, at some future point, being deleted or archived. This is a shame because such data hold tremendous potential future value, including use for identification of non-target taxa by other researchers, or simply in helping to map the distribution of poorly known species. The cloud-computing approach of the Acoustic Pipeline provides a way to overcome this, allowing users to share their data easily, thereby increasing its value for research and conservation. The Acoustic Pipeline incentivises this by incorporating a discounted payment structure to encourage users to share data where they can, passing on savings to clients and enhancing their green credentials. Where data sharing cannot be permitted for commercial reasons,

users can opt for the peace of mind of confidential processing and secure storage if required.

The value of acoustic monitoring

Automated processing of acoustic monitoring data is revolutionising how citizen scientists can participate in the monitoring of bats and other nocturnal taxa, and also offers a significant opportunity for ecologists and environmental managers. Targeted acoustic monitoring approaches have been used to deliver baseline information on the distribution and status of bat species in particular study areas (see Box 1). More broadly, ecological models that predict wildlife population responses to alternative urban designs are likely to prove effective in delivering the robust evidence that decision-makers need when seeking to implement development policy (Gillings 2019, Plummer *et al.* 2020). Such models may be applied to data captured through broader-scale acoustic monitoring (see Box 1).

These types of project, together with more typical commercial impact assessments, can benefit from the management opportunities offered by the BTO Acoustic Pipeline (Figure 4).

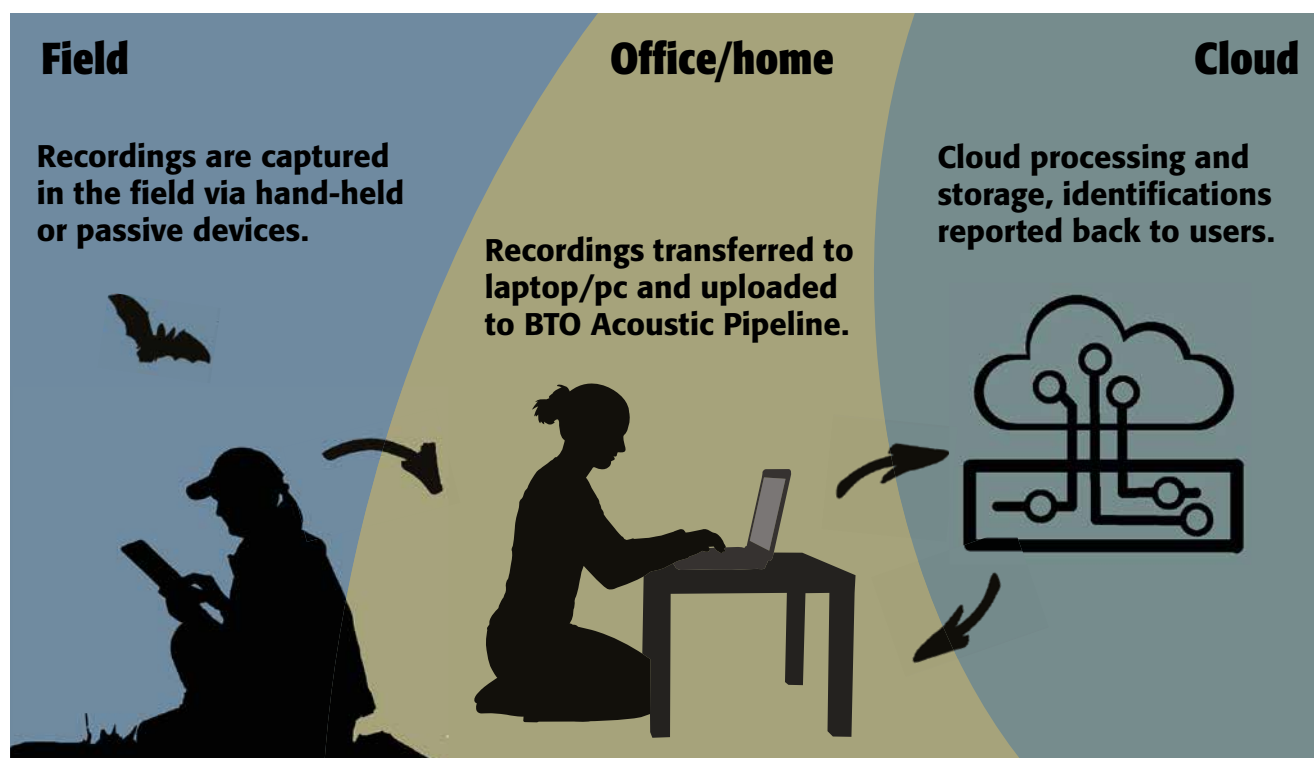


Figure 4. Data flow for the BTO Acoustic Pipeline enables users to manage their recordings and to run them through a classifier that covers a wide range of bat and other taxa calls and sounds. Graphics: Bokica, Jan Stopka and StockMediaProduction: AdobeStock.com.

Box 1. Examples of acoustic monitoring

Baseline information on status and distribution

Newson and Berthinussen (2018) deployed a contract fieldworker to operate passive detectors across a network of priority sites for the North York Moors National Park's Heritage Lottery Fund-funded landscape partnership scheme, while Newson *et al.* (2017b) combined a citizen science network with paid fieldworkers working in remote areas of southern Scotland to inform NatureScot on the potential impact on bats of future wind farm development in the region. At the other end of the scale Danny Adler, working at Cranborne Chase on the Dorset–Wiltshire border, operated SM3 acoustic recorders across a series of woodland sampling plots to study the effects of different woodland management practices on bats, including barbastelle (*Barbastella barbastellus*; Alder *et al.* 2021).

Informing planning and policy decisions

Border *et al.* (2017) used citizen science data collected through the BTO's Norfolk Bat Survey (Newson *et al.* 2015) to quantify the impact of planned housing on the county's bat populations, combining data on 12 bat species with spatially explicit information on housing development planned for the decade ahead. In addition to being able to predict changes in the occurrence or activity for all 12 bat species following the proposed housing plans, the researchers were also able to test the impact of mitigation scenarios operating at different spatial scales. This revealed that the negative effects of the planned housing could be reduced by 46%, on average, by preferentially building on less preferred habitats and in areas with low populations of 'urban-sensitive' bat species. This is exactly the kind of tool that planners want, and something that is contingent on the operation of these large-scale citizen acoustic monitoring schemes, which both represent significant value for money and increase public participation in the planning process.

Access to the acoustic classifiers and the large data libraries underpinning them, coupled with data management tools and reporting, provide a very good return on the relatively small charges levied by such systems. The additional option of allowing the data submitted to be used in wider research work across the sector has big implications for increasing the value of acoustic monitoring efforts. For example, during the first half of 2021 alone, 320 users uploaded over 4.6 million recordings to the Pipeline, resulting in over 2.8 million species identifications. Use of the Acoustic Pipeline comes with free initial credits, enabling potential users to test its effectiveness for their needs. Continued development of the system, and the associated technologies, will no doubt increase the value of acoustic monitoring to ecologists and environmental managers, meaning that more robust data become increasingly available for a broader suite of taxa, and that has to be good.

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Blue Carbon: the Sea, the Coast and the Climate Crisis

“ Natural systems are being pressured by human activity, leading to a very real threat of dangerous climate change. These threats are as great in the marine environment as on land. ”



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Keywords: biodiversity crisis, carbon sequestration, coastal salt marsh, habitat protection, ocean acidification, ocean warming, Project Seagrass

Natural systems are being pressured by human activity as never before, leading to a very real threat of dangerous climate change and biodiversity collapse. Policies related to amelioration of impacts tend to focus on a few terrestrial habitats. This article shows how coastal and marine habitats can absorb and lock away carbon and argues that this must be incorporated into national climate change accounting alongside terrestrial peatlands and woodlands, to drive protection, enhancement and restoration.

Natural systems are being pressured by human activity as never before, leading to a very real threat of dangerous, perhaps catastrophic, climate change (sometimes referred to as climate breakdown) and biodiversity collapse.

These threats are as great in the marine environment as on land. Ocean warming is already resulting in shifting marine species distribution and sea level rise, human development is leading to the loss of coastal habitats, and ocean

acidification, caused by increased CO₂ uptake, is exerting pressure on many species with shells based on calcium carbonate. But, just as on land, natural processes in the marine environment provide opportunities to mitigate climate changes and address the loss of habitats and species. In this article we describe the role that coastal and marine habitats play in the oceanic carbon cycle, how they can absorb and lock away carbon and the value of protecting, enhancing and restoring natural processes in mitigating climate change. We also argue that these habitats must be incorporated into national climate change accounting alongside terrestrial peatlands and woodlands.

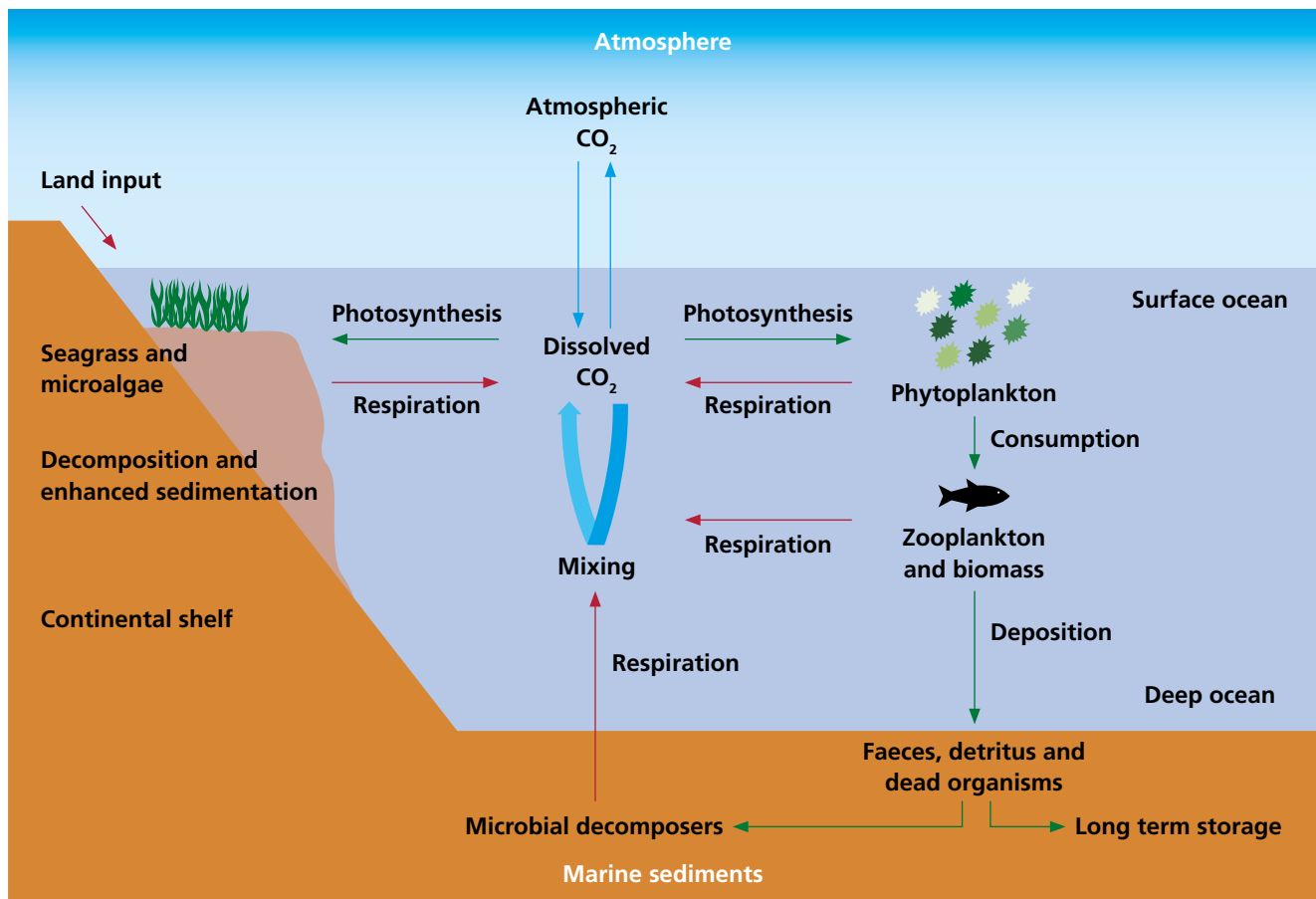


Figure 1. Conceptual diagram of the marine carbon cycle. Based on Natural England Research Report NERR 094 (licensed under the Open Government Licence v3.0).

Oceans play a significant role in the planet's carbon balance, cycling an estimated 83% of all carbon. Figure 1 provides a simplified conceptual diagram of the oceanic carbon cycle. Atmospheric and dissolved CO₂ are in dynamic equilibrium, making the carbon available for marine biological processes. Phytoplankton and, at the coast, macroalgae and plants, capture this carbon through photosynthesis, underpinning most marine food

webs which, in turn, cycle the carbon through a network of consumers. The resulting biomass is deposited in seabed sediments as organic carbon. Inorganic carbon compounds, produced through other processes, also form an important part of seabed sediments. At any one time, therefore, carbon is stored in the living tissue of plants and animals and as organic and inorganic carbon in sediments, collectively known as blue carbon.

It is the extent to which carbon is sequestered by habitats, locked away for the long term, that is of greatest importance in terms of habitats' ability to contribute to mitigating the impacts of human-induced climate changes. Our understanding of the complexities of the carbon cycle in marine and coastal habitats is not yet complete. For example, coastal macroalgae grow extensively around the coast. A recent survey of carbon



Figure 2. Flock of waders on salt marsh, Essex, UK. Salt marsh provides substantial benefits for biodiversity as well as carbon sequestration. Photo: Chris Lawrence Travel, Shutterstock.

“ It is clear that some habitats, especially coastal salt marsh and seagrass meadows, and seabed sediments, have an important role to play in climate change mitigation. ”



Figure 3. Seagrass habitat in the Mediterranean Sea. Seagrass sequesters and stores a significant volume of carbon in plant biomass and sediments. Photo: Rich Carey, Shutterstock

storage and sequestration in different habitats carried out by Natural England (Gregg *et al.* 2021) suggests that the carbon stock of kelp is estimated at around 6.7 tonnes of carbon per hectare ($\text{tC}\cdot\text{ha}^{-1}$). Not all of this can be considered as sequestered. Each winter, kelp is washed up onto beaches, where decomposition will release carbon back into the atmosphere. At the same time, decomposing plant material is washed back into the sea, where it will end up in other coastal and marine habitats. The Natural England report estimates that 11.63 tonnes of CO_2 equivalent (a common unit used to describe the global warming impact of different greenhouse gases) per hectare per year ($\text{tCO}_2\text{e}\cdot\text{ha}^{-1}\cdot\text{year}^{-1}$) are lost from kelp beds, of which only $0.33 \text{ tCO}_2\text{e}\cdot\text{ha}^{-1}\cdot\text{year}^{-1}$ reaches subtidal sediments. However, assessing levels of sequestration in coastal and marine habitats is extremely complicated.

Despite the complexities of assessment, it is becoming clear that some habitats, especially coastal salt marsh (Figure 2) and seagrass meadows (Figure 3), and seabed sediments, have an important role to play in climate change mitigation. Coastal salt marsh and seagrass meadows are similar in that small amounts of carbon are stored as plant biomass, with much larger proportions locked up in soil and

sediments. The Natural England survey reports carbon stock estimates of around $0.6 \text{ tC}\cdot\text{ha}^{-1}$ for salt marsh vegetation and $56 \text{ tC}\cdot\text{ha}^{-1}$ in salt marsh soil, and $0.3 \text{ tC}\cdot\text{ha}^{-1}$ for seagrass plant biomass and $39 \text{ tC}\cdot\text{ha}^{-1}$ for seagrass sediments. Perhaps a more important measure is carbon flux, indicating to what extent habitats are absorbing or releasing carbon. A recent report from the Environment Agency (Beechener *et al.* 2021) suggests that salt marsh habitats absorb $2\text{--}8 \text{ tCO}_2\text{e}\cdot\text{ha}^{-1}\cdot\text{year}^{-1}$, while seagrass meadows lock away $1.6 \text{ tCO}_2\text{e}\cdot\text{ha}^{-1}\cdot\text{year}^{-1}$.

Subtidal sediments are considered the most important store of carbon from biological sources in the marine environment. Although some muddy habitats are rich in organic carbon, particulate inorganic carbon is considered the main carbon store in subtidal sediments. It is also thought that inorganic carbon is more effectively sequestered for the long term, with a residence time of several centuries in undisturbed habitats. The Natural England survey (Gregg *et al.* 2021) reports figures of around $55 \text{ tC}\cdot\text{ha}^{-1}$ for mud and $18 \text{ tC}\cdot\text{ha}^{-1}$ for sand, with an estimate of carbon flux suggesting that $1.98 \text{ tCO}_2\text{e}\cdot\text{ha}^{-1}\cdot\text{year}^{-1}$ is buried in subtidal sediments. More research is needed on carbon storage and sequestration by all coastal and

marine habitats; an assessment of the confidence in the figures presented in the Natural England survey is either “low” or, in the case of salt marsh, “medium”.

Despite this uncertainty, the need for long-term storage of carbon has significant implications for the future management of coastal and marine habitats. Protection of habitats such as salt marsh, seagrass meadows and sediment from damage and disturbance will ensure that the carbon they have stored in the past remains locked away. Well-managed Marine Protected Areas and effective Environmental Impact Assessments are needed to reduce physical pressures from human activities, including bottom-towed fishing and deep-sea mining. In addition, Shoreline Management Plans that encourage managed realignment to allow natural migration of salt marsh will reduce habitat loss through coastal squeeze. But the climate crisis requires more than simply protecting existing carbon sinks. Increasing the area of carbon-accumulating habitats, for example through projects that deliver restoration of seagrass meadows and

salt marsh, will help reduce levels of atmospheric greenhouse gases. An example of managed realignment can be seen at Hesketh Out Marsh on the Ribble Estuary, near Preston, Lancashire, where the Royal Society for the Protection of Birds has created 322 ha of salt marsh by breaching historic sea defences (Climate-ADAPT 2016).

Protection and restoration of coastal and marine habitats has an important part to play in mitigating human-induced climate change. However, this should not be seen in isolation. There are many benefits, for both biodiversity and human society, in enhancing coastal and marine ecosystem services. This has been increasingly recognised in recent publications, including a recent report by Penny Anderson (2021). In addition to the Natural England and Environment Agency surveys already discussed, reports from the British Ecological Society (Stafford *et al.* 2021) and the Natural Capital Committee (2019), and work by Marine Scotland (e.g. Marine Scotland 2020), all highlight the value that these habitats have in addressing the current

“ The climate crisis requires more than simply protecting existing carbon sinks. Increasing the area of carbon-accumulating habitats, for example through restoration of seagrass meadows and salt marsh, will help reduce levels of atmospheric greenhouse gases. ”

climate crisis, with the Natural Capital Committee report stressing the need provide funding for protecting and restoring threatened habitats.

Future work into assessing and enhancing the ecosystem services provided by coastal and marine habitats, such as that being undertaken by Plymouth Marine Laboratory (e.g. Plymouth Marine Laboratory 2017), and the delivery of effective protection and restoration projects, such as those mentioned in this article, are essential in tackling the joint challenges of



Figure 4. Collecting a sediment core to assess carbon sequestration rates.

Box 1. Supporting seagrass restoration through Project Seagrass

From 2016 to 2020, CIEEM offset its unavoidable emissions by making a donation equivalent to the average cost of offsetting the annual carbon tonnage, determined by carbonfootprint.com, to support environmental projects in Great Britain and the island of Ireland. For CIEEM's 2019–20 emissions, a donation of £200 was made to Project Seagrass to support the restoration of seagrass in west Wales.

Project Seagrass is an environmental charity devoted to the conservation of seagrass ecosystems through education, influence, research and action. The charity aims to “reverse the loss of seagrass by turning research into effective conservation action and communication through partnerships with local communities and other stakeholders”.

This work has been kickstarted with monitoring programmes in North Wales and the Isles of Scilly, and the restoration of 2 ha of seagrass in west Wales. The charity also supports research projects in Europe, across the Indo-Pacific and in the Caribbean, looking at the structure, function and resilience of seagrass meadows. Project Seagrass also aims to launch the first ever full-scale seagrass restoration project. Find out more at www.projectseagrass.org/.

the climate and biodiversity crises. However, to be truly effective, these opportunities need to be incorporated into long-term political visions and actions. The sixth, most recent, Carbon Budget (Committee on Climate Change 2020) fails to include coastal and marine habitats for greenhouse gas reduction, focusing solely on woods and peatlands. While these terrestrial habitats are important for ‘green carbon’, the fact that blue carbon is not included in national climate change accounting means that UK government policy ignores that role that coastal and marine habitats can play in mitigating human-induced climate change. If the combined threats of catastrophic climate change and biodiversity collapse are to be ameliorated, then all possible actions need to be taken. We cannot afford to overlook any opportunities. CIEEM is supporting seagrass restoration through carbon offsetting, contributing to the work of Project Seagrass (see Box 1).

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Balancing on the Head of a Pin?

Response to a Review of Good Practice Guidance by Dean *et al.* (2021)

Greater horseshoe bat.



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CBiol FCIEEM(rtd)

Good practice guidance should be based on clear, reliable evidence. A recent study by Dean *et al.* (2021) shows that it is not. Much of the base data that many studies collect, and which are used in syntheses such as good practice guidance, may also be unreliable. If so, then processes such as Conservation Evidence

Keywords: Biodiversity Net Gain, evidence base, limitations, reliability

that rely on good, verifiable field methods and robust evidence underpinning their collations may also need to have their underlying evidence base reconsidered.

Introduction

Has a recent *In Practice* article by Dean *et al.* (2021) inadvertently re-opened a can of worms on the unreliability of evidence-based guidance, and what that means for wilder conservation

outcomes? It would appear that good practice guidance documents used for mitigation or management actions tend not to be supported by references or details of limitations or clear strength of evidence. Looking in detail at 71 documents where evidence to support recommended mitigations or management actions would be expected, only eight (11%) contained references where the recommendations were based on tested cases. As they put it:

“ Much of the guidance that we rely upon as professional ecologists is either not based on evidence or, if it is, then it clearly hasn't identified what that evidence is. ”

Does this mean that acceptance of good practice guidance should be less questioning if it might possibly

approximate to a hunch or unsupported opinion in many instances? As Dean *et al.* (2021) noted, this may also apply to some of the guidance supported by CIEEM.

One of CIEEM's major roles has been to promote and improve the standards and transparency of the work that ecologists do. This matters on the small scale, for individual sites, and the large scale when whole landscapes risk positive or negative changes. Knowing what is real, and what isn't, should matter to all ecologists, and, rising up the scale, to governmental policy makers who will assume that statements and assertions are built on verifiable facts.

Good practice and reliability

When considering doing surveys or management activities, it is normal to refer to good practice guidance before starting work. This should mean that there is a high degree of trust and reliability in the methods used, the work undertaken and the potential outcomes: they are based on a raft of documented facts and are robust. Obviously, where decisions or actions might make or break a species or habitat on a site – causing potential harm, or removing any likelihood of a negative impact – then the expectation is that the methods you use should have a fine pedigree, are reliable and be steeped in evidence-based outcomes. Is this necessarily true?

Dean *et al.*'s (2021) view is that good practice guidance documents should be evidence-based. That seems reasonable. Yet they found that much of the guidance that professional ecologists rely on is not based on evidence, or perhaps not on clear evidence. Hunter *et al.* (2021) indicated that most ecological mitigation and compensation measures in housing applications are not evidence-based either. Like the earlier reservations of Drayson and Thompson (2013) after looking at Environmental Impact Assessments, evidence appears to be in short supply. That seems worrying. But is it surprising?

Guidance in practice

What exactly is guidance? It is essentially a pooled synthesis of approaches and methods that worked,

didn't work or might be equivocal. The challenge is to be sure which of these, or others, are represented in the guidance, and how reliably they can be used. Knowing the balance of these, plus the reliability of the survey base, is critical (Reed 2019a, 2019b). Because if guidance is based on uncertainty and a poor evidence base, and potentially on unreliable data, then alarm bells should start to ring.

Dean *et al.* (2021) used the Cambridge Conservation Evidence approach (essentially looking at sources to examine the evidence base for statements, and to decide if they stack up) to look at the CIEEM body of good practice guidance. Their starting point was Principle 5 of the CIEEM Good guidance: good guidance is based on good evidence. This is not controversial. But the potential unreliability of much survey data is (Reed 2019a, 2019b, 2020, 2021, Hearn *et al.* 2011, Cherrill 2013, 2016, zu Ermgassen *et al.* 2021). If guidance is potentially based on a flimsy set of survey data or missing evidence base, then there are problems about the reliability and interpretation of guidance. Ultimately, of course, if the studies that Conservation Evidence uses may be based in part on unreliable studies with poor validation – that is, not tested for – then the Conservation Evidence system itself risks being unreliable due to lack of evidence, which is not what anyone wants.

Dean *et al.* (2021) showed a state of play that was far from ideal. Rather than a clear audit trail of 'proofs', most guidance was either lacking positive detail or missing evaluation of limitations or negative implications. Also, guidance sources were occasionally conflicted.

Dean *et al.* (2021) note the problem is compounded by the lack of accessibility to published evidence sources, making it just that bit harder to accept that guidance. They suggest that there is a need to collect appropriate data to allow the refinement of guidance.

What are appropriate data? In a series of short notes (Reed 2019a, 2019b, 2020, 2021) I have previously observed that much of the data used in planning cases have shared the same sort of shortcomings that Dean *et al.* (2021) have observed: statements made

“ If guidance is based on uncertainty and a poor evidence base, and potentially on unreliable data, then alarm bells should start to ring. ”

without a robust evidence base, poor substantiation and claims that cannot of themselves be verified with what has been provided. If examined, the data collected often suffer from major limitations, which are usually left unstated. This means that some of the very datasets that are used in many of the cases collated for guidance may well be inappropriate and unreliable. If so, then the pyramid begins to wobble.

That the very reliability of basic survey material might be problematic too risks doubling the issues that Dean *et al.* (2021) noted. Imagine that if poor-quality data collection and outcomes are used as the basis for decision-making, and then get used to form part of the synthesis that good practice guidance relies upon: is there not a likelihood that we are balancing a large body of decision-making on the head of a pin? This means, in simple terms, that much of the synthesis process that Conservation Evidence and other forms of best practice guidance rely on may well be building an edifice on empirically shaky ground. It may best be viewed not as a pyramid with a firm evidential base, but as an inverted pyramid balancing on the head of a pin.

If the initial material that goes into the studies that Conservation Evidence uses is ultimately poorly based, is the situation likely to be any different in the application of survey methods used to collect data that in turn are used to make planning decisions or management decisions? From a range of studies on data reliability in surveys (Cherrill 2013, 2016, Hearn *et al.* 2011) it is clear that there is a high error rate. The implications of this are discussed in a very recent study on Biodiversity Net Gain (BNG) by zu Ermgassen *et al.* (2021). They looked at comparability in grassland surveys between grassland specialists, finding that specialists agreed on both habitat type and condition assessments just 31% of

the time, habitat type alone 42% and condition alone 64%. The experts failed to agree on grassland types. zu Ermgassen *et al.* (2021) concluded that the quality of information going into BNG assessments was often too poor to stand up to scrutiny. If that is the finding for critically important BNG surveys, and if this is replicated in the material that is being produced for planning applications or management decision-making, and then used in the management evidence base underpinning the Conservation Evidence process (and there is no obvious reason to think that it is not), then things look inadequate and are unlikely to be fit for purpose.

More examination of the reliability of the basic survey material that goes into the studies used in guidance, and the Conservation Evidence process, may, in the short term at least, not be welcome. It challenges an important and valuable strand of work, but can we afford to ignore an elephant in the room?

Taking time to set the pyramid back on its broad base seems to be a worthwhile goal. Unless we do, we can expect weakly substantiated policy documents and policy applications based on poorly validated evidence and guidance. The outcomes for biodiversity are equally likely to be poor. More importantly, we can expect QCs and others – aware of Dean *et al.* (2021) – to rip apart evidence from expert witnesses at inquiries on the grounds of evidential uncertainty and unreliability. Correcting this seems to be a sustainable and long-term goal in which we all have a vested interest.

This matter has wider resonance beyond good practice guidance. As zu Ermgassen *et al.* (2021) have shown, Government is perfectly happy to promote policies on BNG without reliable evidence. CIEEM should grasp

the nettle now, remedy the problem and control the future, not fight rear-guard actions which risk damaging its credibility and role in the sector.

How do we get out of this?

Documented good practice is best based on well-trained and scrutinised ecologists producing reliably large sample sizes with clear methods, and evidential reports that include an honest assessment of limitations and problems with the surveys. These should form the basis of aggregations for good practice. Claiming in planning applications, without any form of substantiation, that there are no impacts or limitations is common enough that there is a risk of the profession being viewed as malleable (Carver and Sullivan 2017, Singh *et al.* 2020). zu Ermgassen *et al.* (2021) suggested that Ecological Impact Assessments and BNG assessments should be undertaken by suitably trained professionals, subject to rigorous assessment by regulators. They were concerned that leaving wide scope for unsupported or controvertible judgements comes with risks, especially if ecological consultants lack sufficient training to conduct the relevant specialised ecological assessments (e.g. grassland assessments) or are implicitly pressurised to report a reduced biodiversity unit obligation by clients (Carver and Sullivan 2017).

It behoves us all to make sure that what we say is what we do, and that we can show it. Otherwise, we risk continuing to balance an inverted evidence pyramid on a pin head. That is asking for an only too-ready body of opponents to state the obvious and for the system to come crashing down. It seems easier to gently turn over the pyramid and to make sure that it is standing on firm foundations as well.

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About the Author

Tim Reed FCIEEM(rtd) is a retired former consultant with interests in monitoring and data quality. With degrees from Cambridge and Oxford universities, he worked on bird surveys, management planning, surveying and common standards for the statutory sector before working worldwide with corporates on preventing site impacts, and designing, collecting and testing baseline datasets for monitoring and impact evaluation. He continues to work on bats and birds, especially moorland edge bird communities and nightingales. He also monitors data quality and non-impact claims for protected species in a major development in his local National Park.

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Breaking Down the Barriers to Inclusion



Sally Hayns
CEcol FCIEEM
Chief Executive
Officer, CIEEM

Back in 2020 I published a statement, in response to the Black Lives Matter campaign, talking about my concern about the lack of diversity in the ecological and environmental management sector and how, as a result many members of our society were not able to access opportunities to make their contribution to our

profession and its work to tackle the climate emergency and biodiversity crisis. I spoke about the importance of listening in order to understand what it is that CIEEM as an organisation and we as individuals should do to tackle this inequality. Listening has been very important in the intervening period, but there also needs to be a time for action, so I thought that it is important that I update you on what has happened since that statement was published.

Diversity and Inclusion Progression Framework

We have adopted the Royal Academy of Engineering and Science Council's

Diversity and Inclusion Progression Framework for Professional Bodies, undertaking an assessment of our activities against indicator statements across eight areas of our activity (e.g. governance, training and events, membership). This has resulted in an action plan that has been approved by the Governing Board and is now being implemented. This has or will lead to improvements in the accessibility of CIEEM services, processes and products, supported by greater transparency and reporting.

Equality, diversion and inclusion survey

In March this year we carried out a survey of members looking at six areas of protected characteristic equality, diversity and inclusion (EDI). The survey asked for our members' experiences, both within their careers and within CIEEM, and suggestions for change. We published a summary of this survey in

May 2021 (<https://cieem.net/resource/equality-diversity-and-inclusion-survey-2021/>).

The results of the survey provided a numerical baseline from which to measure change but also provided an important narrative of experiences, frustrations and challenges (and some inspiring examples of how those challenges had been overcome). The report was discussed by volunteer members of our new Diversity and Inclusion Working Group who noted that the scale of the challenge in restoring biodiversity and supporting resilient ecosystems is not diminishing, and nor is the need for skilled and competent practitioners of all backgrounds and identities to be able to deliver the solutions required. At CIEEM we want to represent an inclusive profession, one that is welcoming and representative of our society. We need to be an inclusive profession in order to engage effectively with all stakeholders, understand different perspectives and to be reflective of the society we serve. This means our profession needs to change and CIEEM needs to contribute to that change. We also need to drill down more deeply into some of these areas of inequality to better listen to the voices of those experiencing them and to understand the change that is required.

Breaking down the barriers to inclusion

As part of this 'drilling down' we were pleased to work with specialist stakeholder engagement consultancy Dialogue Matters on a project looking to engage people of colour either working in the profession or aspiring to follow a career as an ecologist or environmental manager. The aim was to identify solutions to the lack of ethnic diversity and representation within environmental and ecological professions. The process included discussion around actions that can be taken to address this, with particular attention being given to identifying what CIEEM can do within its remit to catalyse change. We published a report on this project in September (<https://cieem.net/resource/breaking-down-barriers-to-inclusion-report/>).

Dialogue Matters facilitated two workshops. The first only involved

people of colour, the second involved many of the participants from the first workshop but also other stakeholders, including members of CIEEM's Diversity and Inclusion Working Group, keen to understand and support change. Care was taken to ensure that participants represented different sectors of the profession (private sector, public sector, environmental non-governmental organisations, academia) and career levels (from entry levels through to senior practitioners).

The approach taken encouraged participants in the first workshop to express their hopes for the profession in 2030 – what it would look and feel like to be working as part of the profession as a person of colour. Participants were then asked to explore why the profession is not like that now, where the barriers are and how that might change at different career stages or in different sectors. Finally, participants shared their thoughts regarding potential solutions.

During the second workshop those participants who had not attended the first meeting were able to share their vision for a more diverse and inclusive profession. Time was then spent exploring solutions, including those previously identified, and agreeing why those solutions would bring benefits and the challenges to be overcome in delivering. Actions to deliver the solutions were identified, including whether they were actions that CIEEM should lead on, together with our members, areas that CIEEM could influence or collaborate on, and ideas that CIEEM could pass on to others or advocate. There were also actions that other participants in the workshop could take on. Finally, some time was spent trying to prioritise the actions.

Next steps

The report is available for everyone to read and share with others, and I would urge you to do so. What became clear through this work is that there is a momentum for change that, if we are prepared to turn words into action, can really make a difference. And we do need to make a difference. The lack of ethnic diversity within the profession has been talked about for many decades but it really is time to

change. The first step is to really try to understand what it means to be an aspiring or practising ecologist or environmental manager and not be White British or White Irish. To listen and learn and then commit to supporting those actions that can make a difference.

It is also important to note that a number of the issues and barriers raised are intersectional and can be exacerbated by other aspects of inequality and/or exclusion such as low-income backgrounds, disability and gender. By working to create a more diverse and inclusive profession for all we can start to tackle barriers that exist not just for people of colour but for others who feel frustrated and angered by the unnecessary challenges they face.

Join us

The Diversity and Inclusion Working Group will review the report and proposed actions and prioritise them as part of a proposal to CIEEM's Governing Board. The Board has already committed its support for this work and is prepared to commit resources to effect strategic change. You can get involved by joining the Diversity and Inclusion Working Group. You may have your own experiences of inequality and exclusion to help guide our work, or you may not but still want to see change happen and be part of the process of achieving it. If you are interested in joining the group please email diversity@cieem.net. You will be warmly welcomed.

About the Author

Sally Hayns CECOL FCIEEM is Chief Executive Officer of CIEEM. In addition to overseeing the running of the Institute she currently leads on CIEEM's professional standards and professional development work and is actively involved in policy engagement and outreach work. Sally is also a member of the Chartered Institute of Fundraising and a Trustee of The Mammal Society.

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Ethical Dilemmas

This is our series of problems and conundrums that can face members during their professional practice. The purpose of the feature is to encourage you to reflect on and explore scenarios that you may face during the course of your work and to consider the appropriate ways to respond to ensure compliance with the *Code of Professional Conduct*.

In the September 2021 issue of *In Practice* we described a dilemma in which you are a senior ecologist and have worked for your current consultancy employer for 5 years. They have always been a good organisation to work for but the past couple of years have been very tough financially, a

couple of experienced staff have been 'let go' and you are aware that more redundancies are likely unless things turnaround.

The director of the company is using a low pricing/high volume strategy, which appears to be working, as the consultancy is now very busy but everyone is feeling the pressure. You are aware that the interns, whom you do not manage or supervise, are working very long hours with night-time protected species surveys at least 4 nights a week. Their initial training is minimal and they are often lone-working and travelling long distances to and from survey sites. Employed staff are asked to do surveys no more than 3 nights a week and have time off in lieu allocated to compensate for the additional hours.

You overhear one of the interns telling the other about a recent dusk and dawn bat survey where she had to sleep in the car overnight as she felt too

tired to drive home between surveys. In fact, she had fallen asleep during the dawn survey. She is also getting quite heavily into debt as, although she is doing some bar work at the weekends, the pay isn't enough to cover her living expenses. She doesn't know how much longer she can continue but feels ashamed that she may not be 'tough enough' to make it through.

What do you do?

Our advice

This is a very difficult situation for two reasons. Firstly, the intern does not know that you are aware of her situation. Secondly, both you and the intern may be concerned that raising the issue with your employer may result in you (or her) losing the job or being penalised in some way. Therefore, you will need to handle the situation carefully.

As you are not directly managing or supervising the interns, it is not strictly your responsibility to ensure that they

are being supported in their work. However, there is a moral responsibility here and you should still support the individual as much as possible by providing them with the knowledge and resources they require to try to ameliorate their situation.

It would be best to approach the intern in question in a private setting and explain that you overheard her conversation with her fellow intern and that you are concerned for her well-being, and that you would like to support her but that you will respect her privacy.

You could explain that CIEEM has recently been doing some work around this issue and has produced guidance on Good Working Practices (<https://cieem.net/resource/professional-guidance-series-good-working-practices/>). You could email the intern with a list of useful resources, including relevant CIEEM articles and support, as well as Acas (www.acas.org.uk), the Workplace Relations Commission (www.workplacerelations.ie/en/) and/or relevant webpages of the Citizens Information website (www.citizensinformation.ie/en/employment/employment_rights_and_conditions/).

If you do decide to have a discussion with your employer about the issue, you should first check in with the intern, as they may not wish to have their issues known. If the intern does not wish to have their issues raised on their behalf,

you could outline your own concerns to your employer in more general terms, saying that you are aware of interns doing 4 or more nights in a row and that this is a health and safety issue as well as potentially compromising the accuracy of the data collected. You could offer to share some information

about employment rights and CIEEM's guidance on Good Working Practices.

If the intern does decide to take the issue up with your employer you could offer to be present at the meeting in order to provide support in the discussion.

The next dilemma

You are an experienced ecological consultant working in a major multi-disciplinary consultancy working on a development project in England that includes Ecological Impact Assessment (EclA) and a Biodiversity Net Gain (BNG) assessment, using Natural England's (NE) Biodiversity Metric 3.0. You completed a UKHab habitat survey and NE condition assessment in the autumn and need to report the work quickly to meet your client's timeframes for a planning submission.

You highlighted to your client in your initial proposal that habitat surveys and condition assessment are more reliable in spring and summer, when certain species are more likely to be visible, but agreed to complete the fieldwork in October. You prepare a draft of your BNG report, based upon a precautionary approach to condition assessment, resorting to a default condition of 'high' for all recorded habitats.

The Environmental Impact Assessment (EIA) manager within your consultancy reviews the BNG report draft and insists that you use the condition scores that you recorded on site and state the constraints of the survey season in the limitations section in both the EclA and BNG reports. Their view is that the baseline conditions are what you recorded on site and if the Local Planning Authority picks up on the limitations of the survey season, they can request an update survey and condition assessment during the planning consultation process. They go on to say that if you overstate habitat condition in the BNG report now, the client will be 'locked-in' to delivering more biodiversity units than they would otherwise need to.

What do you do?

Complaints Update

Breaches of the *Code of Professional Conduct*

At a professional conduct hearing held on 22 July 2021, Mr Joseph Lane MCIEEM was found in breach of clause 4 of the *Code of Professional Conduct* in respect of the standard of ecological reports. Mr Lane has been reprimanded with conditions.

At a professional conduct hearing held on 9 September 2021, Mr. Chris Formaggia CEnv MCIEEM was found in breach of clause 4 of the *Code of Professional Conduct* in respect of work undertaken at Llanbradach, Caerphilly. Mr Formaggia has been reprimanded with advice.

CIEEM Awards 2021: Another Inspirational Year

Sally Hayns CEcol FCIEEM

Chief Executive Officer, CIEEM

It has been a very tough year (a tough 2 years to be honest) so it was a joyful sight to see so many members and their guests gathering at the Merchant Taylors Hall in the City of London on 19 October in anticipation of an excellent lunch and the presentation of the 2021 CIEEM Awards.

Having completed the necessary COVID-19 precautions, the conversation in the courtyard sparkled as much as the bubbly that was being drunk as attendees greeted current and former colleagues, including those they had only seen through a computer screen for such a long time. Nobody was on mute, there were no dodgy internet connections, no doorbells rang at key moments and everyone was smiling – it was bliss!

A shade reluctantly, people were enticed into the main hall where they were warmly welcomed by CIEEM President,



Professor Max Wade, who introduced the first presentation, that of CIEEM's most prestigious individual award, the CIEEM Medal. Max read out the citation for Professor Sir Ian Boyd DSC FRSB FRSE, noting that he is an outstanding biological and environmental scientist, and potentially one of the top environmental scientists of his generation. Max described Ian's scientific research work, which covers marine mammals, seabirds, polar research and the impacts of policy on environmental impacts, as well as his 7 years as Defra's Chief Scientific Adviser. In the latter role, as in other aspects of his career, Ian has championed the need for policy to be evidence-led and steered the Government (as well as the Westminster Government can be steered) through some very testing environmental debates. Professor Boyd was warmly applauded as he received the Medal and gave his acceptance speech.

A delicious lunch followed and again, wine and conversation flowed freely. It was up to our excellent host, former Medal winner and CIEEM Fellow David



Stubbs, to call us back to order which he did expertly and with great charm. Guests settled back in their seats as one by one the awards categories were featured, the shortlisted entries announced and the winners revealed. A huge congratulations to all the shortlisted entries and winners, but also to the audience who kept up a high level of applause from the first to the last presentation.



Congratulations again to all those who were shortlisted – it was awe-inspiring to see what you had achieved and we would like to thank all of the entrants who took the time to submit a nomination. We would also like to extend our particular thanks to our sponsors, both returning and new, for their generous support, and to our judges for their time and expertise, without whom this special event would not have been possible. The table on the opposite page shows the shortlisted nominations and the winners for each award. More details on each winner are given at <https://cieem.net/news>.

2022 Awards

So entries are now open for the 2022 Awards and you can find out details, including entry forms and guidance on the website – see www.cieem.net/cieem-awards/. Closing dates are staggered but are all in January 2022 so you do not have much time left to get

your entries in. You can enter as many categories as you like as many times as you like (it's free!) but you must get your entries in by the relevant deadline. Please read the guidance carefully and the entry criteria. We are delighted to announce that we are introducing a new award for 2022 – the University

Programme/Department of the Year – so if you know of a relevant ecology or environmental management programme team or department that go above and beyond in delivering high quality learning opportunities then please do consider nominating them (or, if you work for one, nominate it yourself).













Here are some top tips. Having overseen the Awards for many years now I have a pretty good idea of what the judges are looking for. The number one consideration for judges is impact. What has been achieved by the person/project/initiative and how is that demonstrated? For example, it is not enough to describe what was done, however innovative or challenging that might have been, but how successful it was. This means, for example, that the judges welcome entries for projects that were implemented some time ago but whose impact has been monitored and recorded. Evidence of long-term impact will have the judges quivering with delight.

The next tip – the quality of the evidence. Use your supporting information wisely and never assume that the judges know about the project/person/initiative you are nominating. They can only go on the evidence that you put in front of them.

Finally, if you don't enter you cannot be shortlisted and if you are not shortlisted you cannot win so give it a go! Whatever your location and whatever type of organisation you work for, there are categories relevant to you. Let's make the 2022 Awards the biggest and best yet.

Good luck.



Awards category and sponsor	Shortlisted nominations	Result
In Practice Article Award	<i>Solent Nutrients: an opportunity to build back better?</i> by Allison Potts, David Hayward & Debbie Tann (December 2020)	Winner
	<i>Nitrogen Neutrality Within the Solent Region – An Ecologist's View</i> by David West (December 2020)	Highly Commended
	<i>Seize the moment – New Approaches for Fresh Momentum</i> by Diana Pound (September 2020)	Highly Commended
NGO Impact Award	The Red List for British Mammals – The Mammal Society	Winner
	BatChat Podcast – Bat Conservation Trust	Highly Commended
	The UK Habitat Classification – UKHab Ltd	Highly Commended
Action2030 Award	Global Climate Change: Strengthening Understanding of the Economic Impacts of Climate Change – Dialogue Matters working with Grantham Inst, Oxford University and BEIS	Winner
	Thames Water's company commitment on Biodiversity Net Gain, Thames Water	Highly Commended
	Joshua Styles MCIEEM	Commended
Planning Authority of the Year	Telford & Wrekin Council	Winner
Promising Professional Award	Kimberley Doneo (Mott MacDonald)	Winner
	Joseph D'Souza (Arcadis)	Highly Commended
	Maico Geert Weites (Arcadis)	Highly Commended
	Mariko Whyte (Darwin Ecology)	Highly Commended
	Paola Reason CEcol CEnv FCIEEM	Winner
Member of the Year	David Whitehorne CEnv MCIEEM	Winner
	Mark Lang CEcol CEnv MCIEEM	Commended
	Lancashire Peatlands Initiative – Lancashire Wildlife Trust	Winner
Best Practice Award – Practical Nature Conservation (Large-Scale)	Tetney Blow Wells SSSI Restoration – Anglian Water	Highly Commended
	Ilwyn Celyn Restoration Project – Wildwood Ecology and The Landmark Trust	Winner
	Balsall Common STW Badger Pass – Thomas Wright, Severn Trent	Highly Commended
Best Practice Award – Project Mitigation (Small-Scale)	Howdon Satellite Rail Depot (Ecological Mitigation Strategy) – Nexus, Atkins, Conops Entomology, EcoNorth	Highly Commended
	Sudbrook Papermill Site, Arcadis	Winner
	Warblington Farm Nature Reserve and Havant Borough Council's Mitigation Plan for Nutrient Neutral Development – Havant Borough Council	Winner
Best Practice Award – Project Mitigation (Large-Scale)	East West Rail 2 (EWR2) – East West Rail Alliance	Highly Commended
	Using Immersive Technology to maximise communication of ecological design – AECOM	Commended
	360° Imaging – Environment Agency & Grow2Know	Commended
	Ecosystems Knowledge Network	Winner
Best Practice Award – Knowledge Sharing	The Plastics Project, Mott Macdonald	Highly Commended
	My Wild City – Engaging People with Urban Nature	Commended
	Havant Thicket Reservoir, Portsmouth Water, Atkins, Create 51 and Agilia	Winner
Best Practice Award – Stakeholder Engagement	Wildwood Ecology Ltd	Winner
	Ecology by Design	Highly Commended
	JBA Consulting Ltd	Winner
Small Consultancy of the Year	BSG Ecology	Highly Commended
	Jacobs	Winner
	Atkins	Highly Commended
	RSK Biocensus	Highly Commended
	Arcadis Consulting (UK) Ltd	Commended
	WSP	Commended

An Update on Continuing Professional Development



Bethany Lovell
MCIEEM

Member of CIEEM's Training, Education and Career Development Committee

Continuing professional development (CPD) enables you to ensure your knowledge, understanding and skills remain up to date. CIEEM members must complete a minimum of 30 hours of CPD annually, at least 20 hours of which must be 'structured' activity.

From 1 October 2019, CIEEM set maximum annual limits on some types of CPD in order to encourage members to engage in a range of CPD

activities and avoid repetition between years where it does not appear to aid development of skills. The Training, Education and Careers Development Committee (TECDC) were keen to see how CIEEM members adapted to this change in our latest CPD audit, covering 1 October 2019 to 30 September 2020, but of course there were much bigger influences on members' CPD in 2020!

Planning and recording CPD

The relevance of your CPD should be guided by reference to CIEEM's Competency Framework (<https://cieem.net/resource/competency-framework/>), which explains the types of activities that are relevant for each competency and also defines levels of competency. You can use CIEEM's Competency Self-Assessment Tool (<https://cieem.net/competency-framework-self-assessment-tool/>) to assess your existing skillset and identify areas for further development. CIEEM's CPD Tool, mycareerpath (<https://mycareerpath.cieem.net/Login.aspx>),

should be used to plan and record CPD. Try to record your CPD soon after each activity is completed whilst it's still fresh in your mind.

You can find out more about the requirements in CIEEM CPD Guidance (<https://cieem.net/wp-content/uploads/2019/09/2019-CIEEM-CPD-Guidance.pdf>).

CIEEM annual CPD audit

Each year, a minimum of 5% of members are randomly selected for audit of their CPD record. It is a membership requirement that members provide evidence of their CPD when requested by CIEEM.

TECDC reviews each selected CPD record to ensure members are keeping up to date with their CPD obligations.

Life was very different for many of us in the latter half of this CPD period, and the activities of members audited are reflective of that, but it was great to see how members responded to the challenges.

Examples of CPD for a range of competencies

Here are some examples of how activities reviewed in the audit of members' CPD for the October 2019 to October 2020 period fit the competencies:

Healthy and Safe Working

The audit highlighted that many members had to learn new things about how to create a healthy and safe working environment in the face of the new challenges to our health and wellbeing posed by COVID-19. Many members kept up to date using CIEEM's COVID-19 web pages (<https://cieem.net/i-am/covid-19/>) and Sector Streams webinars (<https://youtube.com/playlist?list=PLPZg7kINmXHDI40gDPE4Xu9Q7CQMSP2sE>).

- HS1**
- Understanding of and compliance with personal, organisational and statutory health and safety legislation, and organisational policy and protocols.
 - Fostering a positive approach to health and safety and wellbeing.
 - Risk management including identification of hazards, risks and control measures for the benefit of staff, contractors and other site users/visitors.
 - Health and safety record keeping and auditing.
 - Achieving a healthy work-life balance.

Information Technology

Members took the opportunity with more time at home to focus on IT skills such as developing GIS skills or acoustic analysis.

IM2 Information technology

- Use of common software packages.
- Use of databases and bespoke information management systems.
- Use of GIS.

Communication

Many members learned how to adapt their methods and style of communication to support remote working, such as learning how to effectively manage a virtual meetings.

- C1**
- Understanding the purpose and appropriate format of different communications and their intended audience.
 - Communicating accurately and clearly in a style appropriate to the audience.
 - Producing clear, concise, factual and accurate written communications.
 - Presenting with impact.
 - Chairing meetings effectively.
 - Negotiation and conflict resolution.
 - Influencing decision-makers.

Surveying

Opportunities for field skills may have been limited, but quite a few members focused on their survey and species identification skills. Wherever you live, it's likely there are plants to observe and identify on a short daily walk from home.

S2 Species identification, handling and population assessment

- Application of knowledge of species ecology and distribution.
- Species identification including the use of appropriate tools and techniques (e.g. analysis of acoustic recordings for identification purposes).
- Safe, biosecure and legal species handling techniques.
- Assessment of population status/importance

Review of the CPD year

It was interesting to see how members responded to the challenges of 2020. We appreciate members probably didn't do the learning they had planned or do

it in the way they planned. As expected, the audit highlighted that work and professional development activities have been difficult for some members, but for others the circumstances throughout much of the CPD period facilitated learning and development opportunities.

Training and conference providers adapted to the restrictions and there were many free and low-cost development opportunities that members took advantage of. For example, CIEEM's webinar programme was expanded over the summer of 2020 and over 46 webinars were offered during the 2019–2020 CPD year, the majority of which were free or low-cost. If you missed out on these, you can find them in the CIEEM Resource Hub. (<https://cieem.net/i-am/resources-hub/>)

Other professional bodies, societies and organisations also expanded their offerings and the audit has shown many members taking these up – perhaps because they can be easier to fit in with other responsibilities, particularly when there are catch-up recordings available. Online conferences boomed in 2020, with providers finding more and more effective ways to facilitate networking with chat rooms, breakout sessions and virtual sponsor stands.

A wider range of CPD opportunities are now opening again, but the 2019–2020 CPD audit has demonstrated members' adaptability, resilience and innovation.

CIEEM is here to support you

If you are struggling to complete your 30 hours of CPD for the year, we encourage you to please get in touch with the Professional Development Team at cpd@cieem.net to discuss your circumstances and ways in which CIEEM can help.

Also remember that members have free access to the CIEEM Member Assistance Programme (MAP) (http://events.cieem.net/Portal/Memberbenefits/Member_Assistance_Programme.aspx). The MAP offers a wealth of online resources and guidance, as well as a free confidential telephone Adviceline. This enables you to discuss any problem(s) you may have with someone who is trained to listen.



Student CIEEM Volunteer Interview

Name: Matthew Duffy

Volunteer role: CIEEM Ireland Member Network, Student Representative (2020–21)

CIEEM membership: Student

What inspired you to pursue a career in ecology?

I was a late bloomer in terms of what I wanted to do as a career, having not discovered my passion for the field until well into my third year at university. At that time, I was participating in my placement year at Donegal County Council's Environment section in 2018. Two things happened around this time. I joined a local walking club in order to keep my fitness up, where I feel in love with the outdoors and I was introduced to the Inishowen Rivers Trust, where I decided on a whim to volunteer with their ARMI macroinvertebrate surveys. From this point on, something just clicked, and I have spent every waking second to try and get into the field.

What was your career path so far, and were there many hurdles in the way?

My career path is more of a twisted, chaotic labyrinth than anything else. Once I realised that ecology was what I wanted to do, I began to volunteer for anything I could possibly spend my time on, whether it be bugs, bats or bottlenose dolphins. I joined up with CIEEM when I kept hearing the name being mentioned in job applications and naturally got curious. From there, I was able to meet up with a few professionals from my own region, which is something I would recommend to all beginners who are able to avail themselves of the service. It can be fairly isolating at the start and difficult to find direction, especially if you live in an area where not that much conservation

happens. Your best bet is to start finding people and offer yourself up to help. It will be an uphill struggle, but the effort is worth it in the end.

As a volunteer at CIEEM, what are your main responsibilities, and what else do you do that is not directly related to work?

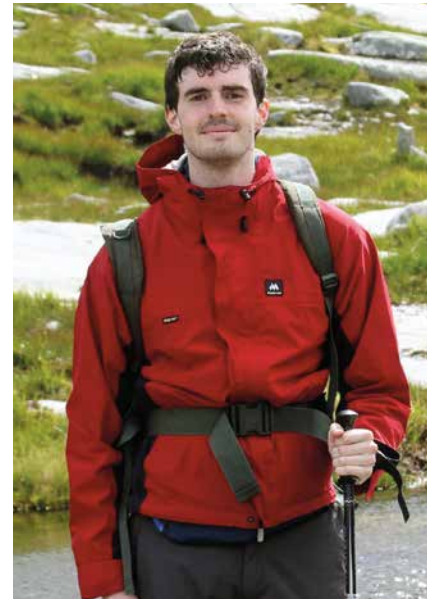
As student representative with the Ireland Member Network, I am responsible for liaising with university staff and ensure that students are given every opportunity to benefit from membership with CIEEM. At the same time, I am trying to fill my time with volunteering with a range of conservation organisations, such as the BTO where I record waterfowl, the Irish Whale and Dolphin Group where I perform land-based whale watches, and Bat Conservation Ireland where I survey and record Daubenton's bats in August. Just trying to get as broad a skillset as I possibly can.

What do you like most about ecology?

By far, the most liberating aspect of ecology is being able to work outdoors for a portion of time. This is something I would not have considered when I was starting out, but between four years of university assignments, a master's and a lockdown to boot, it does put things in perspective. It is a role where I feel I can put all my energy into it and still find some to spare.

What skills and abilities have benefitted you the most?

Persistence and time management. Don't be content to wait until the next day to do a bit of volunteering or get out and take note of whatever species you might encounter, no matter how



mundane. There have been some mornings for me where I would have had to wake up at 4 in the morning, drive for half an hour and walk for another 40 minutes, just to catch the sunrise for a chance of no wind to do a land-based whale watch. If you can pull yourself through something like that once, you can do it for the rest of your life. Unless there's mist. In which case, you can head right back to bed.

What one piece of advice would you give to someone looking to join the sector?

Learn your botany. From my experience, learning your plants and being able to name a few at a glance really goes a long way, especially if they are species that you are likely to encounter anywhere in the country. I would also try to get as acquainted as possible with the documentation that ecologists are likely to encounter in the sector, such as appropriate assessments, environmental impact statements, invasive species reports and ecological impact assessments. Report-writing skills is something that consistently comes up in interviews, so if you have never written a report (likely, if you are only starting out), you can at least say you are aware of the basic structure and how such documentation is supposed to be laid out.

Policy Activities Update



Amber Connett
ACIEEM

Policy Officer, CIEEM

The long-awaited UN Climate Change Conference, COP26, and part one of the even-longer-awaited UN Biodiversity Conference, COP15, took place this autumn giving some weight to 2021's nickname the 'Super Year for Nature'.

At the time of writing, neither event has taken place, so I cannot report here on the agreements made (keep an eye on our blogs!), but we have been busy with engagement activities to ensure they deliver bold positive action for the natural environment.

Following the publication of the IPCC's sixth assessment report, we have issued two statements calling for 2021 to be a pivotal moment in history through COP15 and COP26 and expansion of advice relating to the use of habitats to

absorb and store carbon, to recognise the latest research that promotes utilising the full suite of high-carbon habitats. The former lists a series of recommendations for achieving transformative change, including supporting shifts in economic approaches, implementation of systems thinking in decision-making, and investment in biodiversity skills and training.

UK and England

We have continued our series of engagement meetings with Ministers, Shadow Ministers and Select Committee Chairs in Westminster to discuss the Environment Bill, planning reform, and COP15 and COP26. In September, we met with Chair of the Environmental Audit Committee, Phillip Dunne MP. At the time of writing we are due to meet with Environment Minister Rebecca Pow on 23rd November.

The England Policy Group has issued responses to Defra's Local Nature Recovery Strategies consultation, and the consultation on the approach to beaver reintroduction and management in England. Both are available on our Resource Hub.

We are continuing to plan events for the All-Party Parliamentary Group

(APPG) for Nature at Kew Gardens and Swanscombe Marshes, as well as online briefing events. Find out more at <https://cieem.net/appg-for-nature/>.

Scotland

We have published our advice note on Biodiversity Considerations and Developer Responsibilities in relation to the new and extended Permitted Development Rights for Agricultural and Forestry Buildings. This outlines requirements for the protection of biodiversity, especially in relation to breeding birds and bats. This was developed in consultation with members of the Professional Standards Committee, Scottish ALGE members and Local Authority Biodiversity Officers – thank you to all who contributed.

Throughout Autumn, we conducted a series of meetings to raise a range of issues and opportunities, from the National Planning Framework 4 to green jobs. Meetings were held with Scottish Labour Shadow Minister for Environment and Biodiversity, Mercedes Villalba MSP, and a range of Scottish Government Officials such as the Head of Natural Capital Land Management, Head of Biodiversity Team, Peatland Restoration and Land Quality lead, and

the Head Of Natural Capital Policy and Valuation. At the time of writing, we are confirming dates for meetings with Minister for Environment and Land Reform, Mairi McAllan MSP, Green Party Environment, Climate and Transport spokesperson Mark Ruskell MSP and Scottish Government’s Director for Environment and Forestry.

The Scotland Policy Group is currently drafting a response to the consultation on an agricultural transition in Scotland.

Wales

The Wales Policy Group has published a position statement on the implementation of proposed new agriculture and land use schemes which sets out a series of recommendations for agriculture reform to ensure it delivers for biodiversity and climate targets. Recommendations include landowner access to advice that is professional and evidence-based, strategic planning of climate measures and effective monitoring and enforcement of regulations.

We recently responded to a call for input on priorities for the Climate Change, Environment, and Infrastructure Senedd Committee over the next year. In our response we offered our expertise on issues such as

planning and green infrastructure, and nature-based solutions so we hope to engage further with the committee.

The Wales Policy Group has agreed to produce a briefing for members on Welsh Government’s approach to ensuring net benefits for biodiversity.

Ireland

The Ireland Policy Group has recently responded to the Mid-term Review of the National Peatlands Strategy, Northern Ireland Peatland Strategy and Draft Interventions Proposed for Ireland’s Common Agricultural Policy (CAP) Strategic Plan 2023–2027 consultations. The group is now being co-Chaired by Nick Marchant MCIEEM and Aebhin Cawley CEnv MCIEEM.

Liz O’Reilly (CIEEM Ireland Project Officer) and Nick met with members of the Irish Green Building Council in August to discuss input from CIEEM into revisions of their Home Performance Index scheme, which includes biodiversity indicators, to ensure they are promoting best practice measures. CIEEM is also in discussion with Engineers Ireland and is considering a working group to address the issue of insurance as a roadblock to implementing nature-based solutions.

In October, Liz met with the Royal Institute of the Architects of Ireland to provide feedback on draft building guidance for biodiversity.

Future priorities

Our priority for the coming months will be our events and discussions post-COP26 and ahead of the in-person COP15 event in Kunming, China in April–May 2022. These will focus on highlighting the outcomes of COP26 and how the agreements will be implemented in the UK and Ireland. We will also discuss barriers and solutions, skills requirements and resourcing. More information about these events will be published in our weekly eNews and on our website.

All of our briefings and consultation responses can be found in our Resource Hub (<https://cieem.net/resources-hub>) under ‘Policy Resources’.

About the Author

Amber Connett BSc MSc ACIEEM is CIEEM’s Policy Officer. She is leading the Action 2030 project to help to deliver CIEEM’s actions on the climate emergency and biodiversity crisis, alongside supporting policy activities, overseeing the Country Policy Groups and providing the Secretariat for the All-Party Parliamentary Group for Nature.

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CIEEM Action 2030 member pledges – we need you!

Since we declared an interlinked climate emergency and biodiversity crisis in 2019, the recognition of the need for urgent action at every level has grown. Governments have agreed new action plans for keeping temperature rises below 1.5°C at Climate COP26, Part 1 of Biodiversity COP15 has been and gone, and businesses and individuals have taken up the mantle of reducing their own carbon footprint to reach net zero emissions by 2030.

If we are to reach these targets in the next 8 years, and reverse the decline of biodiversity, we cannot lose this momentum. We must work to our strengths and collaborate with others to address challenges in a joined-up way. A systems thinking approach to projects is needed to avoid unintended impacts, maximise benefits and achieve transformative change.

Ecologists and environmental managers are at the forefront of action to address both the climate emergency and biodiversity crisis. It is essential that we act as visible

champions for change in wider society and are aware of how we can reduce our own operational impacts.

We urge members to commit yourselves to action over the next year, and every year after that until we reverse the trends we see today. This month, we are launching member pledges for you to sign up to over on our Action 2030 webpages. Find out more at <https://cieem.net/2022-member-pledges/>.

CIEEM is grateful to the following organisations for investing in our policy engagement activities:



A Good Time to Think About Becoming Chartered

Laura Wilson

Membership Officer, CIEEM

You are an ambassador for the profession and a champion of the natural environment. Does this sound like you? If it does then it might be time to think about becoming chartered.

The benefits are many and varied. It can increase public confidence in your knowledge as a practitioner, lead to recognition by your employer and others that you are a highly competent professional, and, with chartered status, you become a much-needed role model, able to mentor the less experienced, help maintain standards and support the drive to a green recovery.

CIEEM offers two routes to chartership: Chartered Ecologist (CEcol) and Chartered Environmentalist (CEnv). Both chartership processes at CIEEM have undergone some significant changes this past year to become more streamlined and reduce the workload for applicants and assessors. We have removed the application submission deadlines so that you are not struggling to make a deadline in the middle of your busy season. Previously, CEcol applications were open only to Full or Fellow CIEEM members but now we are accepting applications from Associate grade members who feel they have the required skills and experience, as well as from professional ecologists who are not currently members of CIEEM. CEnv applications remain, as before, only open to Full or Fellow members of CIEEM. There are other changes to both chartership processes which are outlined fully in the guidance and if you have any queries, the Membership team is happy to help.

So what are you waiting for? It is time to think about becoming chartered. Here are the steps:

- Register your interest with us by completing the request form on the relevant chartership page of our website (<https://cieem.net/chartered-status/>) or by contacting the Membership team (membership@cieem.net). We will then be able to send you the form and guidance and inform you of any competencies you could carry forward without having to provide written evidence at Stage One. (Currently, this will be relevant for CEcol applicants who were previously competence assessed in their Full application or those who have a previous unsuccessful CEcol application.)
- CIEEM's Competency Framework is a useful tool to help you plan your next steps to raise your level of expertise and enhance your career. Make use of the Competency self-assessment tool (<https://cieem.net/competency-framework-self-assessment-tool/>) to investigate which competencies you think you might like to evidence. There are 40 competencies and you can use the tool to evaluate as many or as few as you wish and as often as you wish, tracking your progress against them over time. Start collating your evidence for your chosen competencies and make good use of the guidance.
- When writing your evidence, remember to use the STARE method (Situation, Task, Action, Result, Evaluation) and do not be tempted to skip the evaluation stage as this is where assessors are looking to see if you are an ecologist or environmental manager who adapts, learning from mistakes as well as successes.
- Make your role in the examples you are evidencing very clear. As ecologists and environmental managers, you are often working as part of a team but, when thinking about chartership, it is important that you are clear about your individual input. You are often leading that team and so do not be afraid to let yourself shine.
- Find two sponsors who know your work well and who can validate your claimed competencies.
- Get your CPD records up to date on our CPD Tool (<https://mycareerpath.cieem.net/Login.aspx>) as we check the previous three years of CPD to make sure that it meets CIEEM's requirements. These CPD records are also used by the assessors to gain an insight into you as an applicant.
- Once you have everything in place, complete the form and submit it to CIEEM's Membership team.

Now is the time to think about becoming chartered and set your own application deadline so that you are not still thinking about it at the end of next year! The Membership team is here to support you so if you have any queries do not hesitate to contact us. Our fees are available on the website. Chartership may be the next logical step in your career that will lead to that promotion and at the very least it will be a worthwhile accomplishment that establishes you as a highly competent professional in your area of expertise.

About the Author

Laura Wilson joined the Membership and Marketing Team early in 2020 and she is primarily responsible for the processing of applications for the Chartered Ecologist and Chartered Environmentalist routes to chartership. Laura contributes to the Registration Authority, liaises with volunteer assessors, organising the assessments and interviews, and supports applicants throughout their chartership journey.

Contact Laura at: LauraWilson@cieem.net

CIEEM Training Programme: A Year in Review



Louis Ormston
Professional
Development
Coordinator
(Training), CIEEM

As we come to the end of a challenging year, we take the time to reflect on the CIEEM Training Programme and how it has evolved throughout the year.

At the start of 2021, CIEEM continued to take a cautious approach based on government guidelines to plan how the Training Programme would continue in 2021. In February 2021, the UK Government announced its COVID-19 Response for Spring 2021, which led

to the four nations announcing their own lockdown easing plans and we responded by reviewing our in-person training offer to identify how courses could be delivered.

Since May 2021 we have been delivering in-person training whilst adhering to the latest national government guidelines and the vast majority of these courses have involved elements of field-based training and outdoor learning. We have worked closely with our trainers to ensure that the courses were delivered in a safe manner and complied with the national government guidelines at the time.

Many of the in-person courses during May and June 2021 had reduced capacity to reflect the COVID-19 restrictions at the time, meaning some courses were limited to just five attendees and a trainer. With restrictions easing from June 2021, caps on delegate places were gradually removed and from July in-person

courses resumed to full capacity where the trainer and venue staff felt it was safe and appropriate to do so.

Where we were unable to deliver a course in-person, we have worked with the trainer to explore how else the course could be delivered and if this was not possible, then we rescheduled the course. During February to June 2021, 15 courses were rescheduled to ensure compliance with the latest government guidelines at the time.

Although it has been a busy and challenging year, we have lots to celebrate including the continued successful delivery of online training and the welcomed return to field-based in-person training.

During this period, we have continued to develop and strengthen our Training Programme even in the face of the challenges presented by COVID-19. On behalf of CIEEM and the Professional Development Team, I would like to say a big thank you to our trainers and

TRAINING COURSES 2021

Headline figures for the 2021 Training programme

6268 CPD
HOURS

946 TRAINED
DELEGATES

99 COURSES
DELIVERED

74 ONLINE
COURSES

26 TRAINERS

INFORMATION SOURCE

CIEEM Training Programme
January 2021 – December 2021

delegates for adapting so quickly and effectively to online training and to new ways of delivering in-person training.

This year has also seen changes to the Professional Development Team. In February, Siân Kear stepped down as Professional Development Manager and we welcomed Craig Willcock into the post. I then joined the team as Professional Development Coordinator for Training from the end of July. Then in September, we were joined by Johanna Cleaves as our Professional Development Administrator.

As a team we are proud to continue to provide excellent training opportunities for ecologists and environmental managers and we are looking forward to supporting all of our members and non-members in their continued professional development journey.

Looking forward

With a new year around the corner, we are embracing our new ways of

delivering the Training Programme. Supporting our delegates and trainers with online courses and looking for ways to make learning and training accessible and affordable for all. As we look ahead at what a post-COVID-19 training environment might look like, we will approach the next year with a blended model.

Several courses will remain online and others are starting to evolve to have a hybrid approach. A great example of this approach has been the 'Water Vole Ecology and Survey' training course, which was delivered online on the first day of training, covering theory and case studies materials, followed up by an in-person field-based session on the second day. This provides focused classroom-based learning online facilitated by the trainer and also in-person field-based sessions where delegates were able to immerse themselves in the subject matter. We will work closely with our trainers as

they develop new models of working and ensuring they feel supported when delivering their courses.

We will be continuing to invest in our pool of trainers; we ran our first Trainer Forum in November 2021. The Forum is a great opportunity for our trainers to support each other and develop best practice for both online and in-person training. Our quarterly Trainer Forum will continue throughout 2022 and we hope it builds momentum going forward.

We are excited to develop new and exciting courses, based on the needs of ecologists and environmental managers at all levels. If you have any particular courses that you are interested in attending or would like to explore how to become a trainer, then do please email the team at training@cieem.net.

We are continuing to add more courses to our Training Programme as they are developed. To find out more about what training courses we have to offer visit <http://cieem.net/events> or follow us on social media. You can also sign up at <http://cieem.net/enews-sign-up> to receive our weekly eNews.

About the Author

Louis Ormston BSc PGCE is the Professional Development Coordinator for training at CIEEM. He manages the day-to-day facilitation of CIEEM's Training Programme activities and sits on CIEEM's Diversity and Inclusion Working Group. He has over 10 years of experience in the education and training sector with a passion for outreach and promotion of ecological and environmental careers.

Contact Louis at: LouisOrmston@cieem.net

Greening Our Grey: A Synopsis of the CIEEM Scotland Conference



Annie Robinson
Scotland Project
Officer, CIEEM

Over 2 days, 145 delegates gathered virtually for excellent presentations on meeting the challenge of greening urban environments. Speakers outlined innovative approaches, shared good practice for nature-based solutions (NBS) and explored practical implications of implementing blue-green infrastructure in urban environments.

Larissa Naylor (Glasgow University) opened the #GreeningOurGrey conference looking at Integrated Green Grey Infrastructure (IGGI) to improve the multifunctionality of hard, non-building grey infrastructure assets and demonstrated tools for comparing costs-benefits of greening our grey to 'business as usual'. Much interest was generated by Larissa's student, Eliška Kosová, who transported us to the coast and how hard coastal infrastructure can be 'greened' by using ecotiles to mimic geodiversity of rocky shores and support key intertidal species.

Stuart Bence (NatureScot) reported on a study reviewing the current state of biodiversity provision within housing development plans, with analysis of

120 past developments across Scotland and how they delivered for pollinators, SuDS, bats and more, providing a great baseline for future opportunities. Aftab Majeed, Graeme Paton and Astley Hastings of Aberdeen University highlighted that ecosystem services assessment should be mandatory in development planning and management, and Samantha Davenport introduced the Urban Greening Factor tool to evaluate the quality and quantity of green infrastructure in all major developments, benchmarked against target scores in the new London Plan.

Raingardens as multi-functional NBS were introduced by Emily Wadsworth (Green Action Trust). Increasingly added to planning applications, the hope is for 10,000 raingardens in Scotland to become a reality! Heather McFarlane (Fidra) introduced 'Buzztops' (green roofs on bus shelters) as another Greening Our Grey opportunity – requiring local authority, advertiser and community support alongside considered design to be effective.

The opportunities around Vacant and Derelict Land (VDL) were highlighted by Mike Batley and Gillian Barrie (Green Action Trust) and Kathie Pollard (Scottish Land Commission). In 2020, Scotland had 3480 VDL sites totalling 11,486 ha (over twice the area of Dundee!). Gillian's case study on Pocket Parks showed huge benefits for biodiversity, placemaking and communities. Fiona Strachan (NatureScot) showcased transformational projects to create and improve multi-functional green infrastructure at a significant scale in Scotland's towns and cities supported by the ERDF Green Infrastructure Fund.

Opening day two, Francesca Osowska (CEO, NatureScot) highlighted that 83% of Scotland's people live in towns

and cities, and so mainstreaming of NBS and development of urban spaces with blue-green infrastructure is crucial for a successful place, not just a 'nice to have'. A paradigm shift is required to champion innovation and manage green infrastructure as assets not liabilities. Natural capital accounts need including in business cases, especially for public investments, so we can properly account for the value of nature to our well-being economy. We need to deliver development that doesn't just avoid the worst impacts on nature but instead has a positive effect on biodiversity, and CIEEM members will be critical in that endeavour.

The potential for transformational change was highlighted by Max Hislop, describing the ambitious objectives of the Clyde Climate Forest. The 3 Cs, Canopy, Connectivity and Carbon, are driving planting of 18 million trees in urban and rural Glasgow over the next decade, including planting of 101 native woodlands. Julie Waldron (Edinburgh City Council), Wendy Campbell (SEPA) and Dawn Lohead (Scottish Water) showed partnership working across their organisations was crucial to deliver transformational change in water management.

The final session examined practical implications of implementing blue-green infrastructure. Ash Welch (AECOM) proposed 'Using nature to the developer's advantage' when considering living roofs, living walls and SuDS, highlighting published guidance. Heather Rumble (Portsmouth University) argued that whilst soil biodiversity underpins plant life, it is overlooked in green infrastructure design and research. Steve McIntyre (ANS Global) demonstrated that plant species selection is key to long-term success.

Scottish Conference 2021

Round table panelists:

- **Màiri McAllan MSP** (Minister for Environment and Land Reform)
- **Francesca Osowska** (CEO, NatureScot)
- **Julie Waldron** (Senior Planner, City of Edinburgh Council)
- **Emilie Wadsworth** (Strategy & Development Manager, Green Action Trust)



Sponsored by:



Whatever the goal – biodiversity, air quality, stormwater attenuation, temperature regulation, etc. – plant selection is critical.

The #GreeningOurGrey conference concluded with a round table discussion comprising a high-calibre expert panel (see image). Key themes and questions covered:

- How to ensure blue-green infrastructure is considered and mandated in NPF4?
- How will BNG mandated in England and implemented internationally relate to positive effects for biodiversity in NPF4?
- How to encourage best practice and good guidance for biodiversity within development?

- Biodiversity features in planning proposals – success of implementation, monitoring, maintenance and enforcement.
- Funding and resource limitations in local authorities, lack of ecologists and landscape expertise.
- Explore issues faced by developers and awareness of potential actions to utilise.

COVID-19 has demonstrated how important quality green space is to everyone. Ecologists and environmental managers must be at the forefront of the many innovative projects and organisations doing great things. Networking and sharing best practice are imperative!

About the Author

Dr Annie Robinson BSc MSc is the CIEEM Scotland Project Officer based in Aberdeenshire, Scotland. Working alongside the Vice President, Scottish section committee and the Scottish policy group she supports CIEEM members in Scotland in a variety of different ways and raises the profile of CIEEM in Scotland.

Contact Annie at: AnnieRobinson@cieem.net

From the Country Project Officers



Elizabeth O'Reilly – Ireland Project Officer

Dia Dhaoibh / Hello everyone

What a busy autumn

for everyone this year. Here in the Ireland Section, we had a range of events happening. We were delighted to welcome Chris Perry from NIEA to talk to our members about bat survey guidance for wind turbines. We also were joined by Ciaran Cronin to have an interesting chat about the use of detection dogs in ecology and conservation, and in November we were joined by Dusty Gedge to discuss green roofs and biodiversity in Ireland. Recordings of these events and the other Irish Section events are available online (<https://cieem.net/resources-hub/> – filter for Ireland). I would like to give a huge thank you to all our volunteers who help in organising these events and we look forward to sharing an exciting schedule of events going into 2022.

In the past few months, we have also organised student events with UCC and Queens. Our Committee understands the importance of promoting our sector and encouraging the next generation of ecologists into the profession. A particular thanks to our volunteer speakers at these events. And to others who would be interested in doing some student engagement, please do get in touch as we will be running more events across Ireland in 2022.

With lots going on here in Ireland we all deserve a relaxing Christmas break, so we wish you a great one and look forward to seeing you all back in the new year!

Nollaig shona gach duine / Merry Christmas everyone!

Contact Elizabeth at:
Elizabeth@cieem.net



Mandy Marsh – Wales Project Officer

S'mae pawb / Hello everyone

We had a full programme of events

this autumn, with some wonderful talks on marsh fritillary butterflies, working with communities, Welsh lizards and the impacts of culverts on streams and fish. Many thanks to our Member Network volunteers for their hard work arranging these. We have many more in the pipeline too, so don't forget to check our events pages for the upcoming programme.

In October we had an exhibition stand at the All Wales Virtual Careers Fair, a great way to extol CIEEM's virtues and to chat to students via live weblinks. One thing they were all interested in was our mentorship scheme. If you think you could help a young person starting on their career by offering one-to-one guidance, please do get in touch.

Given there are still uncertainties around COVID-19, the next Wales annual conference will be a virtual one again, towards the end of January 2022. Keep an eye out for the final dates to be announced. With all the 'big picture' issues like carbon capture and the climate emergency very much to the fore, we decided our theme would focus on the small (though massively important) world of invertebrates.

As ever, please do contact me at the address below if you have any queries.

Nadolig Llawen a Blwyddyn Newydd Dda i bawb / Merry Christmas and a Happy New Year to all.

Contact Mandy at:
MandyMarsh@cieem.net



Annie Robinson – Scotland Project Officer

Hello everyone

At the joint event with BES in September we explored the

biodiversity and climate COPs (COP15 and COP26) and how they tie together: check out the blog (<https://cieem.net/a-super-year-for-nature-in-scotland-joint-event-by-bes-and-cieem/>) and report (<https://cieem.net/resource/summary-report-from-a-super-year-for-nature-event/>) to find out more. We look forward to planning the second part of this series next year where we will explore outcomes of the COPs and how they will be implemented.

Over 2 days in October, 145 delegates gathered virtually for our Scottish #GreeningOurGrey conference to hear from a wide range of excellent speakers on how we can meet the challenge of greening our urban environments. We heard about innovative approaches, shared good practice in using nature-based solutions and explored some practical implications of implementing blue-green infrastructure in our urban environments. See page 76 for more.

I would like to say a huge thanks to all our volunteer members who contribute so much time and enthusiasm. To committee members, Emily Wadsworth, Iain Adderton and Gareth Ventress who are stepping back from Committee activities after many years we thank you for all your contributions. Your ideas and enthusiasm have been very much appreciated.

We look forward to sharing an exciting schedule of events going into 2022, please get in touch if you would like to be involved.

Have a lovely Christmas and New Year!

Contact Annie at:
AnnieRobinson@cieem.net

British Ecological Society

£250,000 Grant to Connect School Children with Nature

The British Ecological Society (BES) is launching a 3-year project to improve school kids' connection with nature in North-east England.

The BES is working with primary school pupils, teachers and early-career ecologists to deliver a green transformation to 50 schools, thanks to a £248,700 grant from the UK Government's Green Recovery Challenge Fund.

The project aims to create the 'Environmental educators of tomorrow' in disadvantaged areas of North-east England. Working with citizen science organisation MammalWeb Ltd and engagement charity SMASH-UK, the project will run until March 2023.

An eroding connection to nature

There is a lot of good evidence that demonstrates the importance of a connection with nature for us all. For children in particular, the benefits of connecting to nature are profound, including improved health and well-being and changes to attitudes and behaviour towards the environment.

Yet we know that four out of five children in the UK grow up disconnected from nature, and opportunities for children to access nature were decreasing even before the global pandemic.

Figures from Natural England last year revealed that 82% of young people want to prioritise protecting the environment, and 83% reported that nature increased their happiness and mental well-being. However, with the pandemic, 81% of children spent less time outdoors in 2020, with low-income households disproportionately affected. A 2019 study found that children in North-east England spend less time outdoors than anywhere else in the country and have limited opportunities to access nature.

Immersive learning experiences

A love of the natural world often starts with an inspiring experience, and this is what the BES-led project seeks to provide. By bringing these inspirational moments directly into the school and home environment, it will open up the well-being benefits of nature to those currently least able to access them.

The MammalWeb project, led by Professor Philip Stephens of Durham University, has already been shown to enhance pupils' knowledge of and connection to nature by using motion-activated wildlife cameras to learn about the secretive mammalian wildlife around them. The new grant will enable this to be expanded to thousands of pupils.

The project will also provide opportunities for school pupils to see how small wildlife-friendly interventions can lead to positive changes. The creation of wildflower areas, hedgehog highways, bird-feeding stations, nest boxes and insect 'hotels' will enable pupils to monitor the wildlife around their schools.

Through these activities, the programme will increase young peoples' connection to nature, with an estimated 10,000 pupils getting involved.

Training the environmental educators

Six fixed-term jobs and placements in North-east England will be created to coordinate the project, and training will be delivered to an estimated 350 teachers at the partner schools. On



top of this, 50 early-career ecologists will be upskilled as 'environmental educators', collaborating with teachers to develop practical workshops and deliver biodiversity enhancements to school grounds.

The project will help scores of ecologists and educators support young individuals as they enter the job market and pursue a variety of career paths within the environmental sciences. Helping to develop the 'environmental educators of tomorrow' is vital as we emerge from a pandemic.

If you would like to learn more about the project or would like to contribute resources for the ecologists, teachers and pupils involved, please contact Chris at chrisj@britishecologicalsociety.org

The 'Connecting schools to nature in North-east England' project is funded by the Government's Green Recovery Challenge Fund. The fund was developed by Defra and its arm's-length bodies. It is being delivered by The National Lottery Heritage Fund in partnership with Natural England and the Environment Agency.

Green Recovery Challenge Fund



By Members For Members

Full steam ahead for Member Network events

Our volunteers have been busy over the autumn period, organising a fantastic and varied schedule of events for members across the UK, Ireland and Overseas!

This is an opportunity to say a huge THANK YOU to volunteers across our suite of geographic Member Networks and Special Interest Groups for adjusting so brilliantly to a world where we live alongside COVID-19. The regular uptake of online facilities to host events, as well as ensuring any field events are held in a safe manner, has been very gratefully appreciated.

At the time of writing, CIEEM is extremely excited to continue this excellent progress with existing committees, alongside new successfully elected volunteers in 2021. The Secretariat is looking forward to welcoming its new volunteers to the team, and providing them with a full induction so that they can hit the ground running in your new roles! With support of new volunteers, CIEEM member networks can continue to connect members, promote high standards and make the sector inclusive, supportive and as impactful as possible to ensure our future is greener and richer in wildlife.

If you have never been involved with a CIEEM Member Group, here is just a small sample of the superb events that our amazing Member Network and Special Interest Group volunteers have led in the summer and early autumn months. Keep an eye on the CIEEM website for Member Network and Special Interest Group events in the future, and please do come along if you can. These events are usually free or at a reduced price for CIEEM members, so do get involved if you can. It would be great to see you there.



The identification day at Rodley Nature Reserve. Photo: Clare Cashion.

Yorkshire & Humber Geographic Section

Botanical and Invertebrate Identification Day

This event was an opportunity for people to practice and improve their skills in botanical identification while in the field. It was also a fantastic chance to meet with likeminded people in a relaxed setting to share knowledge and skills. It was a chance for those interested in invertebrates, with no prior knowledge or experience, to learn about and identify invertebrates. Led

by brilliant ecologists Clare Cashion and Richard Wilson, a keen group ventured around Rodley Nature Reserve, in the Leeds area, where there was a mixture of wetland, grassland and woodland habitats, recording everything they saw. The team used field guides, keys and books and worked through the features of different plants, and nets to catch and identify invertebrates. Plants recorded included water forget-me-not (*Myosotis scorpioides*), wild marjoram (*Origanum vulgare*) and common fleabane (*Pulicaria dysenterica*).



Marsh fritillary.

Wales Geographic Section

Marsh Fritillaries Captive Breeding Project

This popular online talk took a detailed look at the marsh fritillary (*Euphydryas aurinia*) population reinforcement project managed by the Initiative for Nature Conservation Cymru (INCC). Robert Jones Parry, CEO of INCC, explained that the project is hoping to restore a marsh fritillary population to the South Wales Valleys over the next 5 years with the aim of undertaking targeted habitat restoration to link metapopulations in the landscape. The detailed and well-received talk covered the first 12 months of the project, reporting on progress to date and explained the important lessons learned along the way.

UK Overseas Territories Special Interest Group

Back from the Brink: Practical Restoration in the UK Overseas Territories

This online session looked at two very different restoration projects, starting with the practical restoration of tussac grass (*Poa flabellata*) in the Falkland Islands. Tussac grass is a climax community and key habitat for many other species. The second talk highlighted the restoration of the Bermuda petrel. For 300 years, this species was thought to be extinct, but in 1951 fifteen pairs were found! This talk took participants through the amazing story of the Bermuda petrel's recovery. This was an extremely inspiring event, and anyone with an interest in restoration of habitats or species would have hopefully left that talk with some new ideas and having seen some of the wonderful wildlife of two of the UK's Overseas Territories.

Marine & Coastal Special Interest Group

Marine and Coastal Careers: How to Get Started

This online panel event provided graduates and/or those in the early stages of their careers with an overview of some of the marine and coastal opportunities open to them, together with advice on how to get started or progress. This was grounded in the career histories of the fantastic line up of panellists (members of the SIG), who had a wide range of backgrounds and experiences, including academic research, commercial consultancy, coastal stakeholder projects, environmental NGOs and government bodies. The event began with each panel member providing a brief introduction to their current marine and coastal jobs, along with a summary of how they started out in their careers. They also provided pointers on where they felt future opportunities may lie. The second half of the event consisted of a panel discussion, responding to questions from the audience (including many university students from across the UK and Ireland). This enabled key points to be investigated and explained more fully. Those attending the event felt this was a really valuable insight into the marine side of our sector, and we wish the attendees the best of luck with the beginning of their career journeys.

Q&A

Judy Ling Wong CBE, Honorary President,
Black Environment Network and CIEEM Patron

How did you get into the sector?

I am a poet and painter and environmentalist. In my young days, my love of people led me to enter into the arena of being a community artist. Given a choice, members of the community kept coming up with environmental themes for activities. Through this work, I came into contact with the UK's displaced ethnic minorities with whom I deeply identify. I became a member of the group that conceptualised and created the Black Environment Network (BEN), and then, as its Director, pioneered multicultural environmental participation.

What does your current role involve?

I am very much my own person and choose to engage with a range of committees, advisory groups and campaigns to keep the theme of multicultural environmental participation on the agenda. I carry the BEN challenge that: *"There is no such thing as a purely environmental initiative. A so-called purely environmental initiative is one that has rejected its social, cultural and economic contexts."*

What is your favourite part of your current role?

I love teamwork, connecting with people at all levels, from members of the community to policy makers. I like the innovation and elements of discovery that this involves. Because of who I am, I work across many sectors asserting an integrated approach to environmental participation. It is an adventure as I am consistently invited to creatively approach new territory. I enjoyed putting together the global keynote for the International Center for Cultural Studies, linking the roles of traditional wisdom and technological evolution to climate action. Similarly, the Garner Lecture for the UK Environmental Law Association gave me the opportunity to explore the role

of public outrage in the formulation and effective implementation of environmental law.

What do you think is the biggest issue facing the sector?

Climate change is the issue at the top of the agenda, as it existentially threatens all of nature and people.

What is the next big thing for the sector?

'Local and global' is a theme that has been around for a long time. However, with the climate emergency, and the increasing realisation by society that everything is interconnected, it is posed to become the next big thing for the sector. Associated with it are issues of diversity, equality and inclusion, whether nationally or internationally. The role of ethnic minorities will come to the fore as they are in fact the representatives of the ethnic majorities of the world. White people make up only 10% of the world population.

Who is your hero and why?

Mary Robinson (President of Ireland 1990–1997 and UN High Commissioner for Human Rights 1997–2002). She is a compassionate leader. Pushing the climate justice agenda, she is so astute in identifying the human rights framework as an existing powerful underpinning structure for taking it forward.

Who do you see as a great leader in the sector?

In various ways, society is shifting away from traditional forms of leadership. We now have people coming in from the margins, and groups or movements providing leadership as opposed to single persons, for example young people or Extinction Rebellion. If I had to name a single outstanding phenomenon in the context of a leader, it would be Greta Thunberg. She really focuses all our minds.



If you could change one thing to make the world better for nature and biodiversity, what would it be?

I would like to see the strengthening of scientific validation of indigenous practices that protect nature and biodiversity.

If you could magically change one thing we do as a sector, what would it be?

I would like to see all policy formulated as people-centred policy.

What is your favourite thing to do outside of work?

Meeting my friends in the garden.

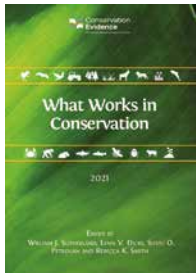
Can you tell readers something random about yourself?

I left Hong Kong at 15 years old. Sometimes people read my CV and think that moving from country to country is very glamorous, when in fact it was a series of disorientating displacements. It has taken me a lifetime to integrate the diverse cultural impact of my wanderings on who I am as a multicultural personality. At the same time, without being a Buddhist, aspects of Chinese Buddhist culture deeply inform my life. Meditation for example provides me with a core of stillness amidst the turmoil of the world.

BOOKS, JOURNALS AND RESOURCES

Compiled by the Academia
Special Interest Group

Book  ACCESS



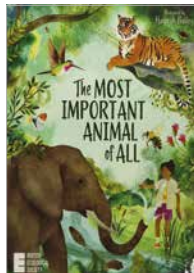
What Works in Conservation 2021

Edited by William J. Sutherland, Lynn V. Dicks, Silviu O. Petrovan and Rebecca K. Smith
ISBN (paperback): 9781800642720

www.openbookpublishers.com/product/1490

This sixth edition of *What Works in Conservation* adds to the extensive evidence database, providing an assessment of the effectiveness of 2526 conservation interventions. This edition provides summarised scientific evidence for the conservation of amphibians, birds, mammals (including marine and freshwater), and subtidal benthic invertebrates, and the management of captive animals. As well as conservation of farmland, forest, peatland, shrubland and heathland, soil fertility, aspects of control of freshwater invasive species and natural pest control are also covered. This book is an invaluable resource for anyone planning conservation projects, improving habitat or informing mitigation plans.

Book



The Most Important Animal of All

Penny Worms (author), Hannah Bailey (illustrator)
Mama Makes Books
ISBN: 978-1-8381381-3-4
www.britishecologicalsociety.org/publications/books/most-important-animal/

Looking for an ecology book of interest to both the young and old? *The Most Important Animal of All* by Penny Worms and Hannah Bailey is that rare thing, a children's book that is scientifically accurate! This is not surprising as it is published in conjunction with the British Ecological Society and is an excellent introduction to ecology with the links between different organisms and their habitats clearly made with annotated illustrations. The description of an elephant's trunk as a nose, a hose and a hand and the importance of bats for bananas and chocolate are sure to appeal to the young – and I too really enjoyed reading it.

Paper Review  ACCESS

Evidence shortfalls in the recommendations and guidance underpinning ecological mitigation for infrastructure developments.

Hunter, S.B., zu Ermgassen, S.O.S.E., Downey, H., Griffiths, R.A. and Howe C.
Ecological Solutions and Evidence 2021, 2(3): e12089.

<https://doi.org/10.1002/2688-8319.12089>

This paper identified a total of 446 ecological mitigation and compensation (EMC) measures that were recommended in a sample of 50 UK housing applications. There were 65 different mitigation measures relating to eight taxa with the rationale for most (56%) justified by citing published guidance. However, critical evaluation, based on systematically tracing back to the original literature, found that in many cases there was no empirical evidence, with just 13 measures having been robustly assessed as beneficial. It is sobering to read about the lack of evidence and, as the authors point out, there is a real danger that assumptions are made on the basis of 'evidence complacency'.

Evidence-based conservation has been endorsed by government agencies with, for example Natural England's recently published 'Science, Evidence & Evaluation Strategy' stating their aim to become an 'evidence-led' organisation. However, this must be seen in the context of the UK Government's commitment to house building and infrastructure projects demonstrating the urgent need for effective EMC as, if measures fail to mitigate impacts of development on protected species, this could greatly exacerbate population declines.

Paper Review  ACCESS

Phantom rivers filter birds and bats by acoustic niche

Gomes, D.G.E., Toth, C.A., Cole, H.J., Francis, C.D. and Barber, J.R.

Nature Communications 2021, 12(1): 1-8
<https://doi.org/10.1038/s41467-021-22390-y>

This research team set out to test the hypothesis that natural acoustic environments shape animal distributions and behaviour by artificially altering the soundscape. For birds this was done at 60 sites, with effect observed over two breeding seasons, while for bats foraging was studied on 144 nights. The authors point out that extraneous noise is rarely considered

during ecological surveys and suggest that this may be influencing distribution and behaviour to a far greater extent than that previously thought. An interesting array of evidence is cited and, while we are all probably aware bats are less likely to emerge in response to the sound of rain did you know spider abundance is affected by the sound of a river? An interesting and thought-provoking read and a timely reminder of how little we know about how wildlife perceives habitat and of the need to mitigate anthropogenic noise wherever possible.

BOOKS, JOURNALS AND RESOURCES

Paper Review  ACCESS

eDNAir: proof of concept that animal DNA can be collected from air sampling

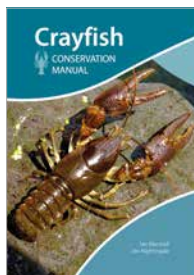
Clare, E.L., Economou, C.K., Faulkes, C.G., Gilbert, J.D., Bennett, F., Drinkwater, R. and Littlefair, J.E.

PeerJ 2021, 9: e11030

<https://doi.org/10.7717/peerj.11030>

This paper is an interesting overview of the use of eDNA, providing a background to the most familiar use in freshwater monitoring and an introduction to more novel approaches. I was somewhat surprised to read about the use of haematophages such as leeches and carrion flies to detect vertebrates, but this depends on dietary preference and metabarcoding. eDNAir is particularly interesting and has been successfully used for assessment of seasonal plant and fungal diversity. Despite this little attention has been paid to viability assessment of animal eDNA carried in the air although this has apparently been successfully carried out by students. One, studying for an MSc in Sweden detected flying insects and a group of high school students in Japan constructed a bird detector and studied breakdown of DNA over time. Truly impressive! Something to watch out for in future.

Book



The Crayfish Conservation Manual

Available for £45 from [NHBS.com](https://www.nhbs.com)

Released later this year, The Crayfish Conservation Manual will collate and refine advice and expertise into one, easy-to-follow book. It will guide future conservation efforts for the white-clawed crayfish and support ecological consultants by presenting best practice. The book is supported by case studies from crayfish experts across the UK.

Report

State of the UK's Woods and Trees 2021

Reid, C., Hornigold, K., McHenry, E., *et al.*
Woodland Trust, 2021

www.woodlandtrust.org.uk/media/49731/state-of-the-uks-woods-and-trees-2021-the-woodland-trust.pdf

Described as a landmark report, The Woodland Trust's *State of the UK's Woods and Trees 2021* provides data and trends regarding the extent of native woods and trees, and trees in towns and cities, including their condition and wildlife value, the benefits people gain from them, the threats and pressures they face, what is being done to help them, and what more we need to do. The report is based on data from multiple sources, including official statistics, published and unpublished reports, academic research, outputs from citizen science projects and trends data from regularly updated datasets. Some headline statistics include that of Britain's native woodlands 93% are currently in poor ecological condition. It is therefore not surprising that the general trend of woodland birds and butterflies over

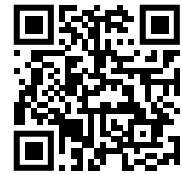
the last five decades is one of steep decline. Reasons for poor ecological condition include woodland fragmentation, poor woodland management, invasive species and imported diseases, all of which are exacerbated by climate change.

While there is currently huge interest in planting trees (by the general public and as mitigation for developments), the report provides statistics which remind us of the importance of our existing trees. For example, in terms of carbon storage, woodlands in Great Britain together hold 213 million tonnes of carbon (in their living trees) of which ancient and long-established woodlands hold 36% (77 million tonnes), even though they make up only 25% of all woodland. Thus highlighting the importance of protecting our existing mature trees and woodlands as well as planting new trees to expand woodland and tree cover.

Although the data and conclusions are somewhat sobering, the report is highly informative and well worth a read.



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It's that time of the year again!

NOMINATIONS FOR OUR 2022 AWARDS ARE OFFICIALLY OPEN!

Over the last year, many professionals across the sector have worked tirelessly to protect the natural world despite barriers posed by the pandemic. Our annual CIEEM Awards is your chance to have your work recognised, inspire the next generation, and celebrate the successes of your peers.

Applications are now being accepted for
the following categories

Best Practice - Innovation

Best Practice – Knowledge Sharing

Best Practice – Large Scale Practical Nature Conservation

Best Practice – Small-Scale Project Mitigation

Best Practice – Large-Scale Project Mitigation

Best Practice - Stakeholder Engagement

Action 2030

Member of the Year

Promising Professional

NGO Impact Award

Consultancy of the Year - Small

Consultancy of the Year – Medium

Consultancy of the Year – Large

In Practice Article

University Programme/Department of the Year

For more information and to download nomination forms,
visit our website www.cieem.net



Forthcoming Events

- Conferences
- Training Courses
- Webinars

For information on these events and more please see <http://cieem.net/training-events>.

<p>8 December An Introduction to Policy and Practice: Understanding how policy and law is made and opportunities Webinar</p>	<p>8 December Winter Tree Identification West Midlands</p>	<p>14 December Influencing Policy for Ecologists and Environmental Managers Webinar</p>	<p>16–17 December Introduction to UK Habitat Classification Online</p>
<p>25 & 27 January 2022 Wales Conference – Invertebrates Online</p>	<p>18–20 January Designing for Biodiversity Net Gain Online</p>	<p>25, 26, 27 & 28 January Intermediate QGIS for Ecologists and Environmental Practitioners Online</p>	<p>16 & 23 February Phase 1 for Development Online</p>
<p>March 2022 Spring Conference – Biodiversity Net Gain in Practice Birmingham</p>	<p>30–31 March Phase 1 Habitat Survey Scotland</p>		



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